



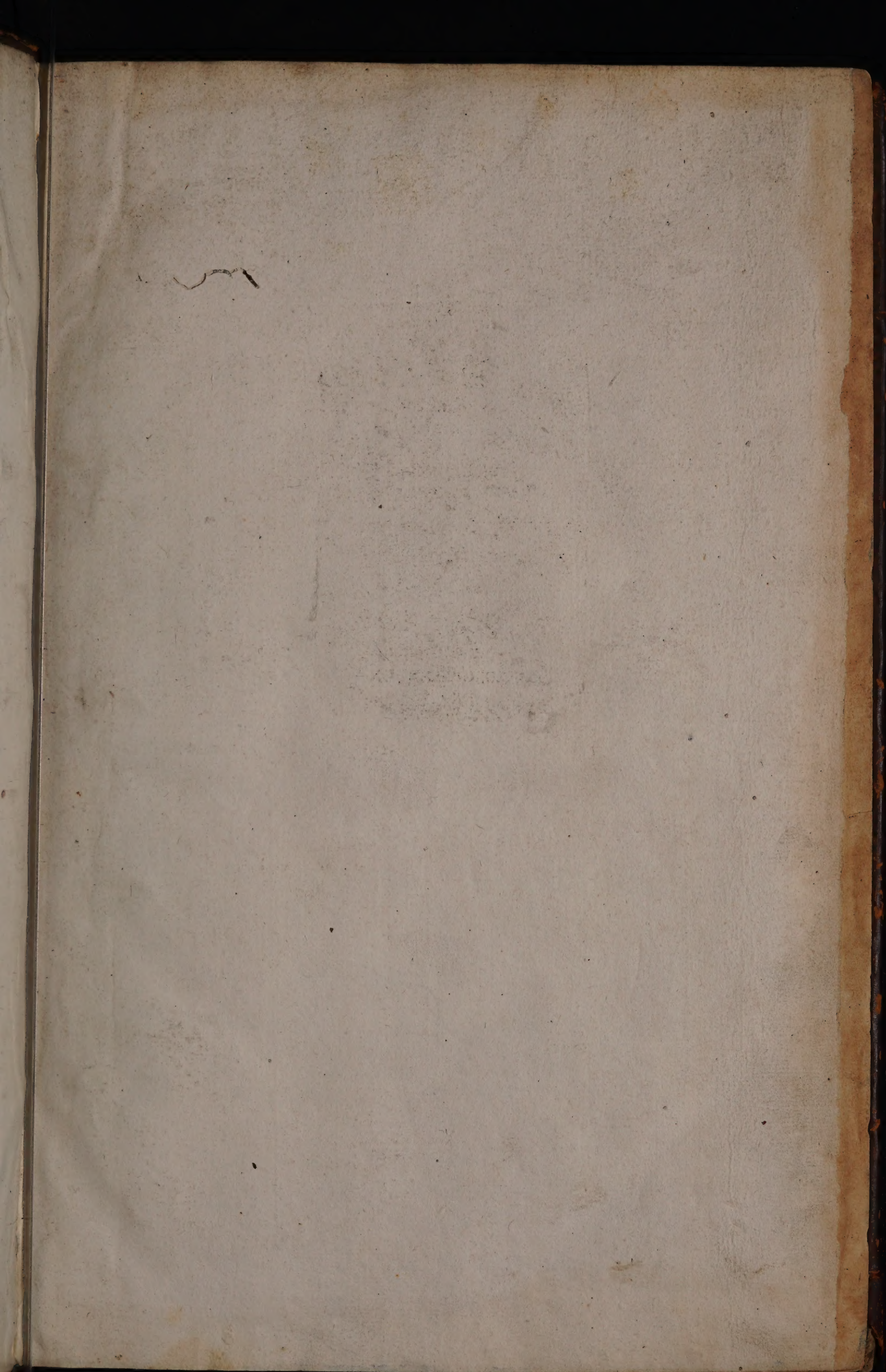


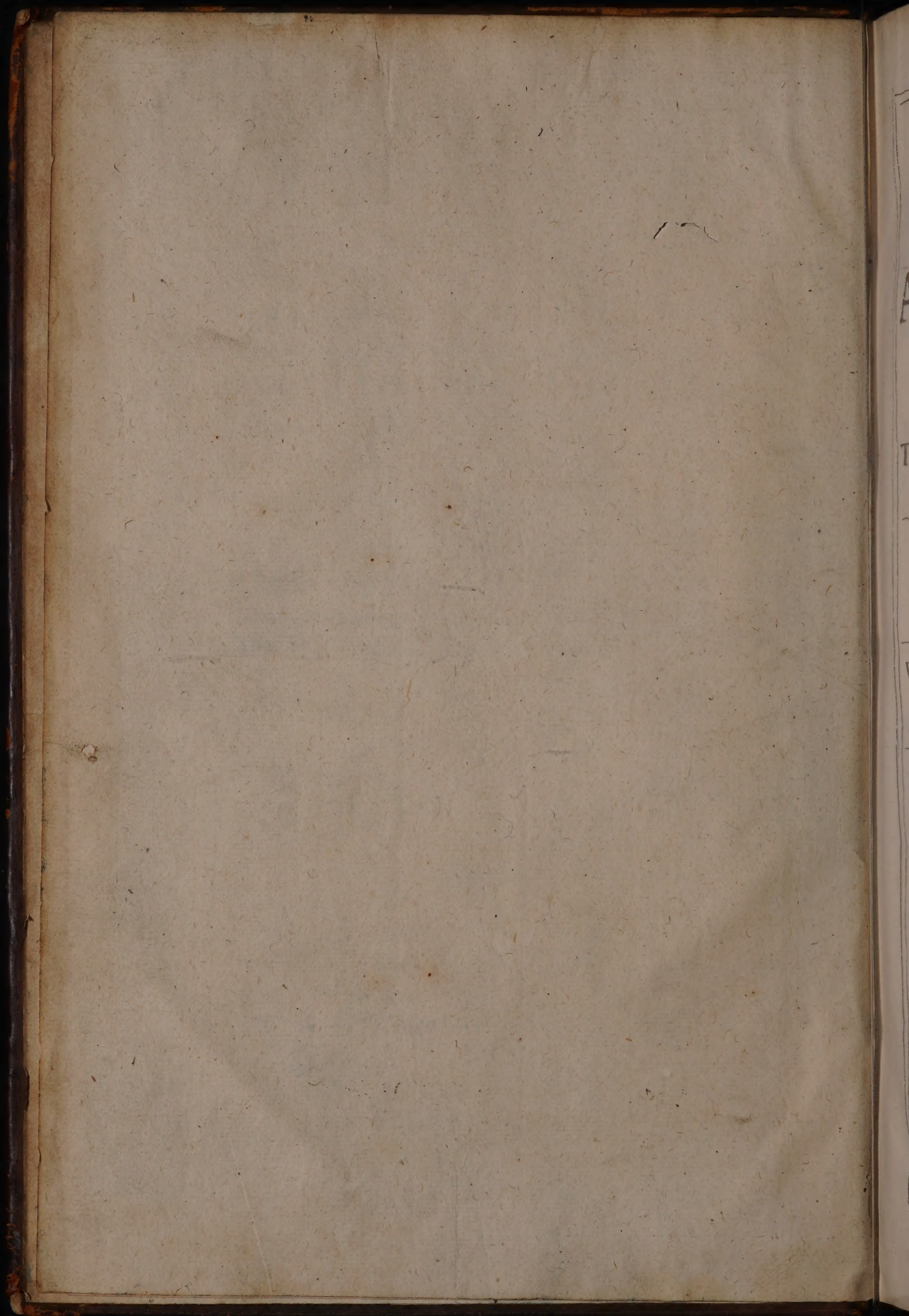
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SYLVA
SYLVARUM:
OR
A Natural History,
IN
TEN CENTURIES.

Whereunto is newly added
The *History Natural* and *Experimental* of LIFE
and DEATH, or of the Prolongation of LIFE.

Published after the Authors Death,
By WILLIAM RAWLEY, *Doctor in Divinity*,
One of his Majesties Chaplains.

Whereunto is added *Articles of Enquiry*, touching *Metals* and
Minerals. And the *New Atlantis*. With an *Alphabetical Table* of
the *Principal things* contained in the *Ten Centuries*.

Written by the Right Honourable
FRANCIS
Lord Verulam, Viscount St. Albans.

The *Tenth Edition*,
In which is added an Epitomy of another peice of his
Lord ship's Works intitled *Novum Organum* (being Transla-
ted for the clearer understanding of this his *Natural History*) never be-
fore published in English.

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MURRAY

A Natural History
of the

Islands of the
Pacific

by
J. S. P. MURRAY



FRANCIS
Taylor

London: Printed by
J. S. P. MURRAY

1844



TO THE
MOST HIGH AND MIGHTY
PRINCE CHARLS.

By the Grace of God,
KING of Great Britain, France, and Ireland,

Defender of the Faith, &c.

May it please Your Most Excellent Majesty,

HHe whole Body of the *Natural History*, either designed or written; by the late Lord Viscount St. *Alban*, was Dedicated to Your Majesty, in his Book *De Ventis*, about Four years past, when Your Majesty was Prince: So as there needed no new Dedication of this VVork, but onely in all humbleness, to let Your Majesty know, it is Yours. It is true, if that Lord had lived, Your Majesty, e're long had been invoked to the Protection of another History, whereof, not Natures Kingdom, as in this; but these of Your Majesties, (during the time and Reign of King *Henry* the Eighth) had been the subject;

The Epistle Dedicatory.

ject; which since, it died under the Designation meerly : There is nothing left, but Your Majesties Princely goodness, graciously to accept of the undertakers Heart and Intentions; who was willing to have parted for a while with his darling Philosophy, that he might have attended Your Royal Commandment in that other VVork, Thus much I have been bold, in all lowliness to represent unto Your Majesty, as one that was trusted with his Lordships VVritings, even to the last. And as this VVork affecteth the Stamp of Your Majesties Royal Protection, to make it more currant to the VVorld; so under the protection of this VVork, I presume in all humbleness to approach Your Majesties presence, and to offer it up into Your Sacred Hands.

Your Majesties most Loyal

and devoted Servant.

W. RAWLEY.



TO THE
R E A D E R.



Having had the Honor to be continually with my Lord, in compiling of this Work; and to be employed therein, I have thought it not amiss (with his Lordships good leave and liking) for the better satisfaction of those that shall read it, to make known somewhat of his Lordships intentions, touching the ordering and publishing of the same. I have heard his Lordship often say, That if he should have served the glory of his own Name, he had been better not to have published this Natural History; for it may seem an indigested heap of Particulars, and cannot have that lustre which Books cast into Methods: But that he resolved to prefer the good of Men, and that which might best secure it before any thing that might have relation to himself. And, he knew well, that there was no other way open to unloose Mens mind, being bound; and (as it were) Maleficate, by the charms of deceiving Notions and Theories; and thereby made impotent for Generation of Works: But only nowhere to depart from the Sense and clear experience, but to keep close to it, especially in the beginning. Besides, this Natural History was a Debt of his, being designed and set down for a third Part of the Instauration, I have also heard his Lordship discourse, That Men (no doubt) will think many of the Experiments contained in this Collection, to be Vul-

To the Reader.

gar and Trivial, mean and sordid, curious and fruitlesse; and therefore he wisheth, that they would have perpetually before their eyes, what is now in doing; and the difference between this Natural History, and others, For those Natural Histories which are extant, being gathered for delight and use, are full of pleasant Descriptions and Pictures; and affect and seek after Admiration, Rarities, and Secrets. But contrariwise, the scope, which his Lordship intendeth, is to write such a Natural History, as may be fundamental to the erecting and building of a true Philosophy: for the illumination of the Understanding; the extracting of Axioms, and the producing of many noble Works and Effects. For he hopeth by this means, to acquit himself of that, for which he taketh himself in a sort bound; and that is, the advancement of Learning and Sciences. For having, in this present Work, collected the materials for the Building; and in his *Novum Organum* (of which his Lordship is yet to publish a Second Part) set down the Instruments and Directions for the Work; Men shall now be wanting to themselves, if they raise not knowledge to that perfection, whereof the Nature of Mortal Men is capable. And in this behalf, I have heard his Lordship speak complainingly, That his Lordship (who thinketh, that he deserveth to be an Architect in this Building) should be forced to be a Workman, and a Labourer; and to dig the Clay, and burn the Brick; and more then that, (according to the hard condition of the Israelites, at the latter end) to gather the Straw and Stubble, over all the Fields to burn the Bricks withal. For he knoweth, that except he do it, nothing will be done; Men are so set to despise the means of their own good. And as for the basenesse of many of the Experiments, as long as they be Gods Works, they are honourable enough: And for the vulgarnesse of them, true Axioms must be drawn from plain experience, and not from doubtful; and his Lordships course is to make VVonders plain, and

To the Reader.

and not plain things Wonders, and that Experience likewise must be broken and grinded, and not whole, or as it groweth; and for Use, his Lordship hath often in his Mouth, the two kinds of Experiments, Experimenta Fructifera, and Experimenta Lucifera. Experiments of Use, and Experiments of Light: And he reporteth himself, whether he were not a strange Man, that should think, that Light hath no Use, because it hath no matter. Further his Lordship thought good also, to add unto many of the Experiments themselves, some gloss of the Causes, that in the succeeding work of Interpreting Nature, and Framing Axioms, all things may be in more readiness. And for the Causes herein by him assigned; his Lordship perswadeth himself, they are far more certain, than those that are rendered by others; not for any excellency of his own wit, (as his Lordship is wont to say) but in respect of his continual conversation with Nature and Experience. He did consider likewise, That by this Addition of Causes, Mens minds (which make so much haste to find out the causes of things;) would not think themselves utterly lost in a vast Wood of Experience, but stay upon these Causes (such as they are) a little, till true Axioms may be more fully discovered. I have heard his Lordship say also, That one great reason, why he would not put these Particulars into any exact Method, though he, that looketh attentively into them, shall find, that they have a secret order) was, Because he conceived that other men would now think that they could do the like; and so go on with a further Collection, which, if the Method had been exact, many would have despaired to attain by Imitation. As for his Lordships love of Order, I can refer any Man to his Lordships Latin Book, De Augmentis Scientiarum; which, if my judgement be any thing, is written in

To the Reader.

The Epistle
is the same,
that should
have been
prefixed to
this Book, if
his Lordship
had lived.

*the exactest order, that I know any writing to be. I will
conclude, with a usual Speech of his Lordships. That this
Work of his Natural History, is the VVorld, as God
made it, and not as Men have made it; for that it bath
nothing, if Imagination.*

VV. RAVVLEY.

The TABLE.

A T A B L E
OF THE
E X P E R I M E N T S.

Century I.

O F straining or Percolation, Outward and Inward. Experiment 8	page 1
Of the Motion upon pressure, Exp. 5	pag. 2
Of Separations of Bodies Liquid by Weight, Exp. 3	pag. 3
Of infusions in Water and Air. Exp. 7	pag. 4
Of the appetite of Continuation in Liquids. Exp. 1	pag. 5
Of Artificial Springs. Exp. 1	pag. 6
Of the Venemous quality of Mans Flesh. Exp. 1	ibid.
Of Turning Air into Water. Exp. 1	ibid.
Of Helping or Altering the Shape of the Body. Exp. 1	pag. 7
Of Condensing of Air to yield Weight, or Nourishment. Exp. 1	ibid.
Of flame and Air commixed. Exp. 1.	pag. 8
Of the secret nature of Flame. Exp. 1	pag. 9
Of Flame in the midst, and on the Sides. Exp. 1	ibid.
Of Motion of Gravity. Exp. 1	pag. 10
Of Contraction of Bodies in Bulk. Exp. 1	ibid.
Of making Vines more fruitful. Exp. 1	ibid.
Of the several Operations of Purging Medicines. Exp. 9	ibid.
Of Meats and Drinks most nourishing. Exp. 15	pag. 12
Of Medicines applied in Order. Exp. 1	pag. 16
Of Cure by custome. Exp. 1	pag. 17
Of Cure by Excess. Exp. 1	ibid.
Of Cure by Motion of Consent. Exp. 1	ibid.
Of Cure of Diseases contrary to disposition.	ibid.
Of Preparation before and after Purging. Exp. 1	pag. 18
Of Stanching Blood. Exp. 1	ibid.
Of change of Aliments and Medicines. Exp. 1	ibid.
Of Diets, Exp. 1	pag. 19
Of Production of Cold. Exp. 7	pag. 196
Of turning Air into Water. Exp. 7	pag. 20
Of Indurations of Bodies. Exp. 8	pag. 22
Of preying of Air upon Water. Exp. 1	pag. 24
Of the force of Union. Exp. 1	ibid.
Of Making Feathers and Hairs of divers colours. Exp. 1	ibid.
Of Nourishment of young creatures in the Egge or Womb, Exp. 1	pag. 25
Of Sympathy and Antipathy. Exp. 3	ibid.
Of the Spirits or Pneumatics in Bodies, Exp. 1	pag. 26
Of the power of Heat. Exp. 1	pag. 27
Of Impossibility of Annihilation. Exp. 1	pag. 28

Century II.

O F Musick. Exp. 14.	pag. 29.
Of the Nullity and Entiry of Sounds. Exp. 4	pag. 32
Of Production, Conservation, and Delation of Sounds. Exp.	pag. 34
Of Magnitude, Exility, and Damps of Sound. Exp. 25	pag. 37
Of Loudness, and Softness, of Sound. Exp. 3	pag. 41

The TABLE.

Of Communication of Sounds. Exp. 3	ibid.
Of Equality and Inequality of Sounds. Exp. 9	ibid.
Of more Treble and Base Tones. Exp. 6	pag. 4
Of proportion of Treble and Base. Exp. 4	pag. 4
Of Extremour, Interiour Sounds. Exp. 4	pag. 45
Of Articulation of Sounds. Exp. 9	pag. 46

Century III.

Of the lines in which Sounds move. Exp. 6.	pag. 49
Of the Lasting or Perishing of Sounds. Exp. 5	pag. 50
Of the Passage in Interception of Sounds. Exp. 5	pag. 51
Of the Medium of Sounds. Exp. 4	pag. 52
Of the Figures of Bodies yeilding Sounds. Exp. 3	ibid.
Of Mixture of Sounds. Exp. 5	pag. 53
Of Melioration of Sounds. Exp. 7	pag. 54
Of Imitation of Sounds. Exp. 6	pag. 55
Of Reflection of Sounds. Exp. 13	pag. 56
Of Consent and Discent between Audibles, and Visibles. Exp. 23	pag. 58
Of Sympathy and Antipathy of Sounds. Exp. 5	pag. 61
Of Hindring, and Helping of Hearing. Exp. 4	pag. 62
Of the Spiritual and Fine Nature of Sounds. Exp. 4	pag. 63
Of Orient Colours in Dissolutions of Metals. Exp. 1	pag. 64
Of Prolongation of life. Exp. 1	pag. 64
Of the Appetite of Union in Bodies. Exp. 1	ibid.
Of the like Operations of Heat and Time. Exp. 1	pag. 65
Of the Differing Operations of Fire and Time. Exp. 1	ibid.
Of Motion; of imitation. Exp. 1	ibid.
Of Infectious Diseases. Exp. 1	ibid.
Of the Incorporations of Powders, and Liquors. Exp. 1	ibid.
Of Exercise of the Body, and the Benefits or evils thereof. Exp. 1	pag. 66
Of meats some Glutting, or not Glutting. Exp. 1	ibid.

Century IV.

Of Clarification of Liquors, and the Accelerating thereof. Exp. 11	pag. 67
Of Maturation, and the Accelerating thereof; and of the Maturation of Drinks and Fruits. Exp. 15	pag. 69
Of making Gold. Exp. 1	pag. 71
Of the several Natures of Gold. Exp. 1.	pag. 73
Of inducing and Accelerating Putrefaction. Exp. 12	ibid.
Of Prohibiting and Preventing Putrefaction. Exp. 1	pag. 75
Of Rotten wood shining. Exp. 1	pag. 77
Of Acceleration of Birth. Exp. 1	pag. 78
Of Acceleration of Growth and Stature. Exp. 1	ibid.
Of Bodies Sulphurous and Mercurial. Exp. 5	ibid.
Of the Chameleon. Exp. 1	pag. 80
Of Subterrany Fires. Exp. 1	ibid.
Of Nitrous Water. Exp. 1	ibid.
Of Congealing of Air. Exp. 1	ibid.
Of Congealing of Water into Crystal. Exp. 1	pag. 81
Of Preserving the Smell and Colour in Rose Leaves. Exp. 1	ibid.
Of the Lasting of Flame. Exp. 10	ibid.
Of Infusions or Burials of divers Bodies in Earth. Exp. 5.	pag. 83
Of the effects of Mens Bodies from several Winds. Exp. 1	pag. 84
Of Winter and Summer Sickneses. Exp. 1	ibid.

The TABLE.

Of Pestilential Years. Exp. 1	pag. 85
Of Epidemical Diseases. Exp. 1	ibid.
Of Preservation of Liquors in Wells or Vaults. Exp. 1	ibid.
Of Stutting. Exp. 1	ibid.
Of Sweet Smells. Exp. 4	pag. 86
Of the Goodness and Choise of Waters. Exp. 7	ibid.
Of Temperate Heats under the Equinoctial. Exp. 1	pag. 87
Of the Coloration of Black and Tawney Moors. Exp. 1	ibid.
Of Motion after the Instant of Death. Exp. 1.	pag. 88

Century V.

Of Acceleration or Hastening forward Germination. Exp. 12.	pag. 89
Of Retarding or putting back Germination. Exp. 9	pag. 92
Of Meliorating, or making better, Fruits and Plants. Exp. 55	pag. 93
Of Compound Fruits, and Flowers. Exp. 55.	pag. 100
Of Sympathy and Antipathy of Plants. Exp. 19	pag. 101
Of making Herbs and Fruits medicinable. Exp. 2	pag. 104

Century VI.

Of Curiosities about Fruits and Plants. Exp. 17.	pag. 107
Of the Degenerating of Plants; and of their Transmutation one into another. Exp. 14	pag. 110
Of the Procerity and Lowness of Plants; and of Artificial dwarfing them. Exp. 5.	pag. 138
Of the Rudiments of Plants; and of the Excrescences of Plants, or super-Plants. Exp. 36	ibid.
Of Producing perfect Plants without seed. Exp. 11	pag. 117
Of Forrain Plants. Exp. 3	pag. 118
Of the Seasons of several Plants. Exp. 6	pag. 119
Of the Lasting of Plants. Exp. 5.	pag. 120
Of several Figures in Plants. Exp. 3	pag. 121
Of some Principal differences of Plants. Exp. 4	ibid.
Of all Manner of Composts and Helps for Ground. Exp. 6	pag. 122

Century VII.

Of the Affinities and Differences between Plants, and Bodies Inanimate. Exp. 6	pag. 125
Of Affinities and Differences between Plants and Living Creatures; And of the Confiners and participles of both. Exp. 3.	pag. 126
Of Plants Experiments Promiscuous. Exp. 67.	pag. 127
Of Healing of Wounds. Exp. 1	pag. 139
Of Fat diffused in Flesh. Exp. 1	ibid.
Of ripening Drink speedily. Exp. 1	ibid.
Of Pilosity and Plumage. Exp. 1	ibid.
Of the Quickness of Motion in Birds. Exp. 1	ibid.
Of the clearness of the Sea, the North wind blowing. Exp. 1	ibid.
Of the different heats of Fire and boiling water. Exp. 1	pag. 140
Of the Qualification of heat by moisture. Exp. 1	ibid.
Of Tawning. Exp. 1	ibid.
Of the Hiccoughs. Exp. 1	ibid.

Of

The TABLE.

Of Sneezing. Exp. 1	ibid.
Of the Tenderness of the Teeth. Exp. 1	pag. 141
Of the Tongue. Exp. 1	ibid.
Of the Mouth out of Taste. Exp. 1	ibid.
Of some Prognosticks of Pestilential Seasons. Exp.	ibid.
Of special Simples for Medicines. Exp. 1	ibid.
Of Venns. Exp. 3	142
Of the Insecta, or Creatures bred of Putrefaction. Exp. 1	pag. 142
Of Leaping. Exp. 1	pag. 145
Of the Pleasures and Displeasures of Hearing, and of the other Senses. Exp. 1	ibid.

Century VIII.

O F Veins of Earth Medicinal. Exp. 1	pag. 147
Of Sponges. Exp. 1	ibid.
Of Sea-fish in fresh waters. Exp. 1	ibid.
Of attraction by similitude of substance. Exp. 1	pag. 148
Of certain Drinks in Turkey. Exp. 1	ibid.
Of Sweat. Exp. 6	ibid.
Of the Glowworm. Exp. 1	pag. 149
Of the impressions upon the body, from several Passions of the Mind. Exp. 10	ibid.
Of Drunkenness. Exp. 4	pag. 152
Of the Hurt, or Help of Wine taken moderately. Exp. 1	pag. 153
Of Caterpillars. Exp. 1	ibid.
Of the Flies Cantharides. Exp. 1	pag. 161
Of Lassitude. Exp. 2	pag. 154
Of casting the Skin and Shell in some Creatures. Exp. 1	ibid.
Of the Postures of the Body. Exp. 3	ibid.
Of Pestilential years. Exp. 1	pag. 155
Of some Prognosticks of hard Winters. Exp. 1	ibid.
Of certain Medicines that condense and relieve the Spirits. Exp. 1	ibid.
Of Paintings of the Body. Exp. 1	ibid.
Of the use of Bathing and Anointing. Exp. 1	pag. 156
Of Chamolletting of Paper. Exp. 1	ibid.
Of Cuttle Ink. Exp. 1	ibid.
Of Earth increasing in weight. Exp. 1	ibid.
Of Sleep. Exp. 3	ibid.
Of teeth and hard substances in the Bodies of Living Creatures. Exp. 11	pag. 157
Of the Generation, and Bearing of living Creatures in the womb. Exp. 3	pag. 159
Of species Visible. Exp. 2	pag. 160.
Of Impulsion and Percussion. Exp. 3	ibid.
Of Titulation. Exp. 1	pag. 161
Of scarcity of Rain in Egypt. Exp. 1	ibid.
Of Clarification. Exp. 1	pag. 162
Of Plants without leaves. Exp. 1	ibid.
Of the Materials of Glass. Exp. 1	ibid.
Of Prohibition of Putrefaction, and the long conservation of Bodies. Exp. 1	ibid.
Of Abundance of Nitre in certain Sea-shores. Exp. 1	pag. 163
Of Bodies born up by Water. Exp. 1.	ibid.
Of Fuel consuming little or nothing. Exp. 1	ibid.
Of cheap Fuel. Exp. 1	pag. 164
Of gathering of wind for freshness. Exp. 1	ibid.
Of Trials of airs. Exp. 1	ibid.
Of encreasing Milk in Milch-Beasts. Exp. 1	ibid.
Of Sand of the Nature of Glass. Exp. 1.	ibid.
Of the Growth of Corral. Exp. 1	ibid.
Of the Gathering of Manna. Exp. 1	pag. 163
	ibid.
	Of

The TABLE.

Of Correcting of Wines. Exp. 1	ibid.
Of Bitumen one of the Materials of Wild fire. Exp. 1	ibid.
Of Plaster growing as hard as Marble. Exp. 1	ibid.
Of the Cure of some ulcers and Hurts. Exp. 1	pag. 166
Of the Healthfulness or Unhealthfulness of the Southernwind. Exp. 1	ibid.
Of Wounds made with Brass or with Iron, Exp. 1	ibid.
Of Mortification by Cold. Exp. 1	ibid.
Of Weight. Exp. 1	ibid.
Of Super-Natation of Bodies. Exp. 1	ibid.
Of the Flying of unequal Bodies in the Air. Exp. 1	pag. 167
Of water that it may be the Medium of Sounds. Exp. 1	ibid.
Of the Flight of the Spirits upon odious object. Exp. 1	ibid.
Of the super-reflexion of Eccho's. Exp. 1	ibid.
Of the Force of Imagination imitating that of the Sense. Exp. 1	pag. 168
Of Preservation of Bodies. Exp. 1	ibid.
Of the Growth or multiplying of Metals. Exp. 1	ibid.
Of the drowning the more base Metal in the more precious. Exp. 1	ibid.
Of the Fixation of Bodies. Exp. 1	pag. 169
Of the restless Nature of things in themselves, and their desire to change. Exp. 1	ibid.

Century IX.

OF Perception in Bodies insensible, tending to natural Divination and subtil tryals. Exp. 30	pag. 171
Of the Causes of Appetite in the Stomach. Exp. 1	pag. 176
Of sweetness of Odour from the Rainbow. Exp. 1	ibid.
Of sweet smells. Exp. 1	pag. 177
Of the corporeal substance of smells. Exp. 1	ibid.
Of Fetide and fragrant Odours. Exp. 1	ibid.
Of the Causes of Putrefaction. Exp. 1	pag. 178
Of Bodies imperfectly mixt. Exp. 1	pag. 179
Of Concoction and Crudity. Exp. 1	ibid.
Of Alterations which may be called Majors. Exp. 1	ibid.
Of Bodies Liquefiable, and not Liquefiable. Exp. 1	pag. 180
Of Bodies Fragile and Tough. Exp. 1	ibid.
Of the two kinds of Pneumatics in Bodies. Exp. 1	pag. 181
Of Concretion and dissolution of Bodies. Exp. 1	ibid.
Of Bodies hard and soft. Exp. 1	ibid.
Of Bodies ductile and tensile. Exp. 1	ibid.
Of several passions of Matter, and characters of Bodies. Exp. 1	pag. 182
Of Induration by sympathy. Exp. 1	ibid.
Of Honey and Sugar. Exp. 1	pag. 183
Of the finer sort of base Metals. Exp. 1	ibid.
Of certain Cements and Quarries. Exp. 1	ibid.
Of the Altering colours in Hairs and Feathers. Exp. 1	ibid.
Of the difference of Living Creatures, Male and Female. Exp. 1	pag. 184
Of the Comparative Magnitude of Living Creatures. Exp. 1	ibid.
Of Producing Fruit without Coar and Stone. Exp. 1	ibid.
Of the Melioration of Tobacco. Exp. 1	pag. 185
Of several Heats working the same Effects. Exp. 1	ibid.
Of Swelling and Dilatation in Boiling. Exp. 1	ibid.
Of the Dulcoration of Fruits. Exp. 1	pag. 186
Of Flesh Edible, and not Edible. Exp. 1	ibid.
Of the Salamander. Exp. 1	ibid.
Of the contrary operations of Time, upon Fruits and Liquors. Exp. 1	pag. 187
Of blows and bruises. Exp. 1	ibid.
Of the Orris Root. Exp. 1	ibid.

The TABLE.

Of the compression of Liquors. Exp. 1	ibid.
Of the Working of Water upon Air contiguous. Exp. 1	ibid.
Of the Nature of Air. Exp. 1	pag. 118
Of the Eyes and Sight. Exp. 7	ibid.
Of the colour of the Sea, or other Water. Exp. 1	pag. 189
Of Shell-Fish. Exp. 1	ibid.
Of the Right side and the Left. Exp. 1	pag. 190
Of Frictions. Exp. 1	ibid.
Of Globes appearing flat at distance. Exp. 1	ibid.
Of Shadows. Exp. 1	ibid.
Of the Rowling and breaking of the Seas. Exp. 1	ibid.
Of the Dulcoration of Salt-water. Exp. 1	ibid.
Of the return of Saltness in pits by the Sea-shore. Exp. 1	pag. 191
Of Attraction by similitude of substance. Exp. 1	ibid.
Of Attraction. Exp. 1	ibid.
Of Heat under earth. Exp. 1	ibid.
Of Flying in the Air. Exp. 1	ibid.
Of the Scarlet Dy. Exp. 1	ibid.
Of Malificating. Exp. 1	pag. 192
Of the Rise of Liquors or Pouders, by means of flame. Exp. 1	ibid.
Of the influences of the Moon. Exp. 1	ibid.
Of Venigar. Exp. 1	pag. 194
Of Creatures that sleep all Winter. Exp. 1	ibid.
Of the Generating of Creatures by Copulation, and by Putrefaction. Exp. 1.	ibid.

Century X.

OF the Transmission and Influx of Immaterial Vertues, and the Force of Imagination, whereof there be Experiments Monitory, three in all. Exp. 11	pag. 197
Of Emission of Spirits in Vapour, or Exhalation, odour like. Exp. 26	pag. 201
Of Emission of Spiritual Species which effect the Senses. Exp. 1	pag. 204
Of Emission of Immaterial Vertues, from the Minds, and the Spirits of Men by Affections, Imagination, or other Impressions. Exp. 21	ibid.
Of the secret Vertue of Sympathy, and Antipathy. Exp. 39	pag. 208
Of secret Vertues and Properties. Exp. 1	pag. 214
Of the General Sympathy of mens Spirits. Exp. 1	pag. 215



NATURAL HISTORY

Century I.



Dig a Pit upon the *Sea-shore*, somewhat above the High-water Mark, and sink it as deep as the Low-water Mark; And as the *Tide* cometh in, it will fill with *Water*, Fresh and Potable. This is commonly practised upon the Coast of *Barbary*, where other Fresh *Water* is wanting. And *Cæsar* knew this well, when he was besieged in *Alexandria*; for by digging of Pits in the *Sea-shore* he did frustrate the laborious Work of the Enemies, which had turned the *Sea-water* upon the Wells of *Alexandria*, and so saved his Army, being then in Desperation. But *Cæsar* mistook the cause; for he thought that all *Sea-sands* had Natural Springs of *Fresh-water*. But it is plain, that it is the *Sea-water*, because the Pit filleth according to the Measure of the *Tide*: And the *Sea-water* passing or straining through the Sand leaveth the Saltness.

I remember to have read, that Tryal hath been made of *Salt-water* passed through *Earth*; through ten Vessels, one within another, and yet it hath not lost his Saltness, as to become potable: But the same Man saith, that (by the relation of another) *Salt-water* drained through twenty Vessels, hath become fresh. This Experiment seemeth to cross that other of Pits, made by the *Sea side*; and yet but in part, if it be true, that twenty repetitions do the effect. But it is worth the Note, how poor the Imitations of Nature are, in common course of Experiments, except they be led by great Judgment, and some good Light of *Axioms*. For first, there is no small difference between a Passage of *Water* through twenty small Vessels, and through such a distance, as between the Low-water and High-water Mark. Secondly, there is a great difference between Earth and Sand; for all Earth hath in it a kind of Nitrous Salt, from which, Sand is more free: And besides, Earth doth not strain the Water so finely as Sand doth. But there is a third point, that I suspect as much, or more than the other two; and that is, that in the Experiment of Transmission of *Sea-water* into the Pits, the *Water* riseth; but in the Experiment of Transmission of the *Water*, through the Vessels, it falleth: Now certain it is, that the Salter part of *Water* (once

B

falted

I.
Experiments
in Confort,
touching the
Straining and
Passing of Bo-
dies one thorow
another; which
they call Per-
colation.

2.

salted throughout) goeth to the bottom. And therefore no marvel if the draining of Water by descent, doth make it fresh: Besides, I do somewhat doubt, that the very dashing of the Water that cometh from the Sea, is more proper to strike off the salt part, than where the Water slideth of her own motion.

3. It seemeth *Percolation* or *Transmission* (which is commonly called *Straining*) is a good kind of *Separation*, not only of thick from thin, and gross from fine, but of more subtile Natures; and varieth according to the Body, through which the *Transmission* is made. As if through a Woollen-bag, the liquor leaveth the fatness; if through sand, the saltness, &c. They speak of severing Wine from Water, passing it through Ivy-wood, or through other the like porous body, but *Non constat*.

4. The Gum of Trees (which we see to be commonly shining and clear) is but a fine passage, or straining of the Juice of the Tree, through the Wood and Bark. And in like manner *Cernish Diamonds*, and *Rock Rubies*, (which are yet more resplendent than Gums) are the fine Exudations of Stone.

5. *Aristotle* giveth the cause vainly, Why the *Feathers* of Birds are of more lively colours than the Hairs of Beasts; for no Beast hath any fine Azure, or Carnation, or Green Hair. He saith it is, because Birds are more in the Beams of the Sun than Beasts, but that is manifestly untrue; for Cattle are more in the Sun than Birds, that live commonly in the Woods, or in some Covert. The true cause is that the excrementitious moisture of living Creatures, which maketh as well the Feathers in Birds as the Hairs in Beasts, passeth in Birds through a finer and more delicate Strainer, than it doth in Beasts: For Feathers pass through Quills, and Hair through Skin.

6. The *Clarifying* of *Liquors* by Adhesion, is an inward *Percolation*, and is effected, when some cleaving Body is mixed and agitated with the *Liquors*; whereby the grosser part of the Liquor sticks to that cleaving Body; and so the finer parts are freed from the grosser. So the *Apothecaries* clarify their Syrups by Whites of Eggs, beaten with the Juices which they would clarify; which Whites of Eggs gather all the dregs and grosser parts of the Juice to them; and after the Syrup being set on the fire, the Whites of Eggs themselves harden and are taken forth. So *Ippocrass* is clarified by mixing with Milk, and stirring it about, and then passing it through a Woollen-Bag, which they call *Hippocrates Sleeve*; and the cleaving Nature of the Milk, draweth the Powder of the Spices, and grosser parts of the Liquor to it, and in the passage they stick upon the Woollen bag.

7. The clarifying of Water, is an experiment tending to Health, besides the pleasure of the Eye, when Water is Crystalline. It is effected by casting in, and placing pebbles at the head of a Current, that the Water may strain through them.

8. It may be *Percolation* doth not onely cause clearness and splendor, but sweetness of savor; for that also followeth, as well as clearness, when the finer parts are severed from the grosser. So it is found, that the sweats of men that have much heat, and exercise much, and have clean Bodies and fine Skins, do smell sweet, as was said of *Alexander*; and we see commonly, that Gums have sweet Odors.

9. Experiments
in Confort,
touching
Motion of Bodies
upon their
Pressure.

TAKE a Glass and put Water into it, and wet your finger, and draw it round about the lip of the Glass, pressing it somewhat hard; and after you have drawn it some few times about, it will make the Water frisk and

and sprinkle up in a fine Dew. This *instance* doth excellently demonstrate the force of *Compression* in a solid Body. For whensoever a solid Body (as Wood, Stone, Metal, &c.) is pressed, there is an inward tumult in the parts thereof, seeking to deliver themselves from the *Compression*: And this is the cause of all *Violent Motion*. Wherein it is strange in the highest degree, that this *Motion* hath never been observed, nor inquired; it being of all *Motions*, the most common, and the chief root of all *Mechanical Operations*. This *Motion* worketh in round at first, by way of Proof and Search, which way to deliver it self, and then worketh in Progress, where it findeth the deliverance easiest. In *Liquors* this *Motion* is visible; for all *Liquors* stricken, make round circles, and withal dash; but in *Solids* (which break not) it is so subtle, as it is invisible, but nevertheless bewrayeth it self by many effects, as in this *instance* whereof we speak. For the *Pressure* of the Finger furthered by the wetting (because it sticketh so much the better unto the Lip of the *Glass*) after some continuance, putteth all the small parts of the *Glass* into work, that they strike the *Water* sharply; from which *Percussion*, that sprinkling cometh.

If you strike or pierce a *Solid Body* that is brittle, as *Glass* or *Sugar*, it breaketh not only where the immediate force is, but breaketh all about into shivers and fitters; the *Motion* upon the *pressure* searching all ways, and breaking where it findeth the *Body* weakest.

The Powder in Shot being dilated into such a Flame, as endureth not *Compression*, moveth likewise in round (the Flame, being in the nature of a *Liquid Body*) sometimes recoyling; sometimes breaking the *Piece*; but generally discharging the *Bullet*, because there it findeth easiest deliverance.

This *Motion* upon *Pressure*, and the Reciprocal thereof, which is *Motion* upon *Tensure*; we use to call (by one common name) *Motion of Liberty*; which is, when any *Body* being forced to a *Preternatural* Extent or Dimension, delivereth and restoreth it self to the natural: As when a *blown Bladder* (pressed) riseth again; or when *Leather* or *Cloth* tentured, spring back. These two *Motions* (of which there be infinite instances) we shall handle in due place.

This *Motion* upon *Pressure* is excellently also demonstrated in *Sounds*: As when on chimeth upon a *Bell*, it soundeth; but as soon as he layeth his hand upon it, the *sound* ceaseth: And so, the *sound* of a *Virginal String*, as soon as the Quill of the Jack falleth upon it, stoppeth. For the *sounds* are produced by the subtle *Percussion* of the Minute parts of the *Bell* or *String* upon the Air; All one, as the *Water* is caused to leap by the subtle *Percussion* of the Minute parts of the *Glass* upon the *Water*, wherefore we spake a little before in the *Ninth Experiment*, For you must not take it to be the local shaking of the *Bell* or *String* that doth it. As we shall fully declare when we come hereafter to handle *Sounds*.

TAKE a *Glass* with a *Belly*, and a long *Neb*, fill the *Belly* (in part) with *Water*: Take also another *Glass*, whereinto put *Claret Wine* and *Water* mingled. Reverse the first *Glass*, with the *Belly* upwards, stopping the *Neb* with your Finger; then dip the mouth of it within the second *Glass*, and remove your Finger. Continue it in that posture for a time, and it will unminge the *Wine* from the *Water*; the *Wine* ascending and settling in the top of the upper *Glass*, and the *Water* descending and settling in the bottom of the lower *Glass*. The passage is apparent to the Eye; for

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14.

Experiments in Consort, touching Separations of Bodies by weight.

you shall see the *Wine*, as it were, in a small vein, rising throught the *Water*. For handfomness sake (because the working requireth some small time) it were good you hang the upper *Glass* upon a Nail. But as soon as there is gathered so much pure and unmixed *Water* in the bottom of the lower *Glass*, as that the Mouth of the upper *Glass* dipeth into it, the *Motion* ceaſeth.

15. Let the upper *Glass* be *Wine*, and the lower *Water*; there followeth no *Motion* at all. Let the upper *Glass* be *Water* pure, the lower *Water* coloured or contrariwise there followeth no *Motion* at all. But it hath been tryed, that though the mixture of *Wine* and *Water*, in the lower *Glass*, be three parts *Water*, and but one *Wine*; yet it doth not dead the *Motion*. This *Separation* of *Water* and *Wine* appeareth to be made by *Weight*; for it must be of *Bodies* of unequal *weight*, or else it worketh not; and the heavier *Body* must ever be in the upper *Glass*. But then note withal, that the water being made pensile, and there being a great *VWeight* of *Water* in the Belly of the *Glass*, sustained by a small Pillar of *Water* in the neck of the *Glass*; it is that which setteth the *Motion* on work: For *Water* and *Wine* in one *Glass* with long standing, will hardly sever.

16. This *Experiment* would be extended from mixtures of several *Liquors* to *Simple Bodies*, which consist of several Similiar parts: Try it therefore with *Broyn* or *Salt-water* and *Fresh-water*, placing the *Salt-water* (which is the heavier) in the upper *Glass*, and see whether the *Fresh* will come above. Try it also with *Water thick Sugred*, and *Pure Water*; and see whether the *Water* which cometh above, will lose his sweetness: For which purpose, it were good there were a little Cock made in the Belly of the upper *Glass*.

17.
Experiments
in Consort,
touching Ju-
dicious and
Accurate In-
fusions both
in Liquors and
Air

IN *Bodies* containing fine Spirits, which do easily dissipate when you make *Infusions*; the Rule is, A short stay of the *Body* in the *Liquor* receiveth the Spirit, and a longer stay confoundeth it; because it draweth forth the Earthy part withal, which embaseth the finer. And therefore it is and Error in *Physitians*, to rest simply upon the length of stay for increasing the vertue. But if you will have the *Infusion* strong, in those kind of *Bodies*, which have fine Spirits, your way is not to give longer time, but to repeat the *Infusion* of the *body* oftner. Take *Violets*, and infuse a good Pugil of them in a Quart of *Vinegar*, let them stay three quarters of an hour, and take them forth, and refresh the *Infusion* with like quantity of new *Violets* seven times, and it will make a *Vinegar* so fresh of the *Flower*, as of a twelve-moneth after it be brought you in a Saucer, you shall smell it before it come at you. Note, that it smelleth more perfectly of the *Flower* a good while after, then at first.

18. This rule which we have given, is of singular use for the preparations of *Medicines*, and other *Infusions*. As for example, the Leaf of *Burrage* hath an excellent Spirit, to repress the fuliginous vapor of Dusky Melancholly, and so to cure Madness: But nevertheless, if the Leaf be infused long, it yieldeth forth but a raw substance of no vertue: Therefore I suppose, that if in the Must of *Wine* or Wort of *Beer*, while it worketh before it be Tuned, the *Burrage* stay a small time, and be often charged with fresh, it will make a soveraign Drink for *Melancholly Passions*. And the like I conceive of *Orange Flowers*.

19. *Rubard* hath manifestly in it Parts of contrary Operations: Parts that purge, and parts that bind the Body; and the first lay looser, and the latter lay deeper:

deeper; So that if you infuse *Rubarb* for an hour, and crush it well, it will purge better, and bind the Body less after the purging, than if it stood Twenty four hours: This is tried, but I conceive likewise, that by repeating the *Infusion* of *Rubarb*, several times (as was said of *Violets*) letting each stay in but a small time, you may make it as strong a *Purging Medicine*, as *Scammony*. And it is not a small thing won in *Physick*, if you can make *Rubarb*, and other *Medicines* that are *Benedict*, as strong Purgers, as those that are not without some malignity.

Purging Medicines, for the most part, have their *Purgative Vertue* in a fine Spirit, as appeareth by that they endure not boiling, without much loss of vertue. And therefore it is of good use in *Physick*, if you can retain the *Purging* of Vertue, and take away the unpleasant taste of the Purger; which it is like you may do, by this course of *infusing* oft with little stay. For it is probable, that the horrible and odious taste is in the grosser part.

Generally, the working by *Infusions* is gross and blind except you first try the issuing of the several parts of the Body, which of them issue more speedily, and which more slowly; and so by apportioning the time, can take and leave that quality which you desire. This to know there be two ways; the one to try what long stay, and what short stay worketh, as hath been said; the other to try, in order, the succeeding *Infusions*, of one and the same Body, successively, in several *Liquors*. As for example, Take *Orange-Pills*, or *Rosemary*, or *Cinnamon*, or what you will; and let them *infuse* half an hour in *Water*; then take them out, and *infuse* them again in other *Water*; and so the third time; and then taste and consider the *first Water*, the *Second*, and the *Third*, and you will find them differing, not only in strength and weakness, but otherwise in taste or odor; for it may be the *First Water* will have more of the scent, as more fragrant; and the *Second* more of the taste, as more bitter or biting, &c.

Infusions in *Air* (for so we may call *Odours*) have the same diversities with *Infusions* in *Water*; in that the several *Odours* (which are in one Flower, or other Body) issue at several times, some earlier, some latter: So we find, that *Violets*, *Woodbines*, *Strawberries*, yield a pleasant sent, that cometh forth first; but soon after an ill sent quite differing from the former. Which is caused not so much by mellowing, as by the late issuing of the grosser Spirit.

As we may desire to extract the finest Spirits in some cases; so we may desire also to discharge them (as hurtful) in some other. So *Vine Burnt*, by reason of the evaporating of the finer Spirit, inflameth less, and is best in Agues: *Opium* leeseeth some of his poysonous quality, if it be vaped out, mingled with Spirit of *Vine*, or the like: *Sean* leeseeth somewhat of his windiness by decocting; and (generally) subtile or windy Spirits are taken off by Incension, or Evaporation. And even in *Infusions* in things that are of too high a spirit, you are better pour off the first *Infusion*, after a small time, and use the latter.

Bubbles are in the form of an *Hemisphere*; *Air* within, and a little Skin of *Water* without: And it seemeth somewhat strange, that the *Air* should rise so swiftly, while it is in the *Water*; and when it cometh to the top, should be staid by so weak a cover, as that of the *Bubble* is. But as for the swift ascent of the *Air*, while it is under the *Water*, that is a *Motion* of *Percussion* from the *Water*, which it self descending, driveth up the *Air*; and no *Motion* of *Levity* in the *Air*. And this *Democritus*

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24.

Experiments
Solitary,
touching the
Appetite of
Continuation
in Liquids.

called *Motus Plage*. In this common *Experiment*, the cause of the enclosure of the *Bubble* is for that the Appetite to resist Separation, or Discontinuance (which in solid *Bodies* is strong) is also in *Liquors*, though fainter and weaker: As we see in this of the *Bubble*; we see it also in little Glasses of Spittle that Children make of rushes; and in Castles of Bubbles, which they make by blowing into *Water*; having obtained a little degree of Tenacity by Mixture of Soap: We see it also in the *Stillicides* of *Water*, which, if there be *Water* enough to follow, will draw themselves into a small Thred, because they will discontinue; but if there be no remedy, then they cast themselves into round Drops; which is the Figure, that saveth the Body most from Discontinuance: The same reason is of the Roundness of the *Bubble*, as well for the Skin of *Water*, as for the *Air* within: For the *Air* likewise avoideth *Discontinuance*; and therefore casteth it self into a round Figure. And for the stop and arrest of the *Air* a little while, it sheweth, that the *Air* of it self hath little, or no appetite of Ascending.

25.

Experiment
Solitary,
touching the
making of
Artificial
Springs.

THe Rejection, which I continually use, of *Experiments* (though it appeareth not) is infinite; but yet if an *Experiment* be probable in the Work, and of great use, I receive it, but deliver it as doubtful. It was reported by a sober man, that an *Artificial Spring* may be made thus: Find out a hanging Ground, where there is a good quick Fall of Rain-water. Lay a Half-Trough of Stone, of a good length, three or four foot deep within the same Ground; with one end upon the high Ground, the other upon the low. Cover the Trough with Brakes a good thickness, and cast Sand upon the top of the Brakes: You shall see (saith he) that after some showres are past, the lower end of the Trough will be like a *Spring* of *Water*, which is no marvel, if it hold, while the Rain-water lasteth; but he said it would continue long time after the Rain is past: As if the Water did multiply it self upon the Air, by the help of the Coldness and Condensation of the Earth, and the Consort of the first Water.

26.

Experiment
Solitary
touching the
Vemous
quality of
Mans Flesh.

THe *French* (which put off the name of the *French disease*, unto the name of the Disease of *Naples*) do report, That at the siege of *Naples*, there were certain wicked Merchants that barrellled up *Mans Flesh* (of some that had been lately slain in *Barbary*) and sold it for *Tunney*; and that upon that foul and high nourishment, was the Original of that *Disease*. Which may well be; For that it is certain, that the *Canibals* in the *West-Indies*, eat *Mans Flesh*; and the *West-Indies* were full of the Pox when they were first discovered: And at this day the *Mortalest poysens*, practised by the *West-Indians*, have some mixture of the Blood, or Fat, or Flesh of Man. And divers Witches, and Sorceresses, as well amongst the *Heathen*, as amongst the *Christians* have fed upon Mans flesh, to aid (as it seemeth) their Imagination, with high and foul Vapors.

27.

Experiments
Solitary
touching the
Version and
Transmutati-
on of Air in-
to Water.

IT seemeth that these be these ways (in likelihood) of *Version* of Vapors or Air, into *Water* and *Moisture*. The first is *Cold*, which doth manifestly Condense; as we see in the. *Contracting of the Air* in the *Weather-Glass*; whereby it is a degree nearer to *Water*. We see it also in the *Generation of Springs*, which the *Ancients* thought (very probably) to be made by the *Version* of Air into *Water*, holpen by the *Rest*, which the Air hath in those parts, whereby it cannot dissipate. And by the coldness of *Rocks* for there

there *Springs* are chiefly generated. We see it also in the effects of the *Cold* of the *Middle Region* (as they call it) of the *Air*; which produceth *Dews* and *Rains*. And the Experiment of turning *Water* into *Ice* by *Snow*, *Nitre*, and *Salt* (wherefore we shall speak hereafter) would be transferred to the turning of *Air* into *Water*. The second way is by *Compression*; as in *Stillatories*, where the Vapor is turned back, upon it self, by the Encounter of the Sides of the *Stillatory*; and in the *Dew* upon the Covers of *Boiling Pots*; and in the *Dew* towards *Rain*, upon *Marble*, and *Wainscot*. But this is like to do no great effect; except it be upon Vapors, and gross *Air*, that are already very near in Degree to *Water*. The third is that, which may be searched into, but doth not yet appear; which is, by *Mingling* of *Moist Vapors* with *Air*; and trying if they will not bring a Return of more *Water*, then the *Water* was at first: For if so, That increase is a *Version* of the *Air*: Therefore put *Water* into the bottom of a *Stillatory*, with the neck stopped; weigh the *Water* first: hang in the Middle of a *Stillatory* a large *Sponge*; and see what quantity of *Water* you can crush out of it; and what it is, more, or less, compared with the *Water* spent; for you must understand, that if any *Version* can be wrought, it will be easily done in small Pores: And that is the reason why we prescribe a *Sponge*. The fourth way is probable also, though not appearing; which is, by *Receiving the Air* into the small Pores of *Bodies*; For (as hath been said) every thing in small quantity is more ealie for *Version*; and Tangible Bodies have no pleasure in the consort of *Air*, but indeavor to subact it into a more *Dense Body*: But in *Entire Bodies* it is checked; because, if the *Air* should Condense, there is nothing to succeed: Therefore it must be in *Loose Bodies*, as *Sand*, and *Powder*, which we see, if they lie close, of themselves gather Moisture.

It is reported by some of the *Ancients*, That *Whelps*, or other *Creatures*, if they be put young into such a Cage, or Box, as they cannot rise to their Stature, but may increase in bread or length, will grow accordingly, as they can get room; which, if it be true, and feasible, and that the young *Creature*, so pressed, and streightned, doth not thereupon die; it is a means to produce *Dwarf Creatures*, and in a very strange Figure. This is certain, and noted long since, That the pressure, or Forming of Parts of *Creatures*, when they are very young, doth alter the shape not a little: As the stroaking of the Heads of *Infants*, between the Hands, was noted of old, to make *Macrocephali*; which shape of the Head, at that time, was esteemed. And the railing gently of the Bridge of the Nose, doth prevent the Deformity of a Saddle Nose. Which observation well weighed, may teach a means, to make the Persons of Men, and Women, in many kindes, more comely and better featured, than otherwise they would be; by the Forming and Shaping of them in their infancy: As by Stroaking up the Calves of the Legs, to keep them from falling down too low; and by Stroaking up the Forehead, to keep them from being low Foreheaded. And it is a common practise to swathe *Infants*, that they may grow more straight and better shaped and we see young Women, by wearing straight Bodies, keep themselves from being Gross and Corpulent.

Onions, as they hang, will many of them shoot forth; and so will *Pennyroyal*; and so will an Herb called *Orpin*; with which they use, in the Countrey, to trim their Houses, binding it to a Lath, or stick, and setting it against a wall. We see it likewise, more especially, in the greater

28.
Experiment
Solitary,
touching the
Helps to-
wards the
Beauty and
good Features
of Persons.

29.
Experiments
Solitary,
touching the
Condensing of
Air in such
sort as it may
put on
Weight, and
yield Nourish-
ment,

Semper-

Semper-vive, which will put out Branches, two or three years: But it is true, that commonly they wrap the Root in a cloth besmeared with *Oyl*; and renew it once in half a year. The like is reported by some of the *Ancients* of the stalks of *Lillies*. The cause is, for that these *Plants* have a strong dense, and succulent moisture, which is not apt to exhale; and so is able, from the old store, without drawing help from the Earth, to suffice the sprouting of the *Plant*: And this sprouting is chiefly in the late Spring, or early Summer; which are the times of putting forth. We see also, that *Stumps* of *Trees*, lying out of the Ground, will put forth Sprouts for a time. But it is a noble tryal, and of very great consequence, to try whether these things, in the sprouting, do increase weight; which must be tryed, by weighing them before they be hanged up; and afterwards again when they are sprouted. For if they increase not in weight, then it is no more but this, That what they send forth in the sprout, they leese in some other part; but if they gather weight, then it is *Maguale Naturæ*: For it sheweth, that *Air* may be made so to be condensed, as to be converted into a *Dense Body*; whereas the race and period of all things, here above the Earth, is to extenuate and turn things to be more *pneumatical*, and rare; and not to be retrograde, from *pneumatical* to that which is *Dense*. It sheweth also, that *Air* can nourish; which is another great matter of consequence. Note, that to try this, the Experiment of the *Semper-vive*, must be made without oyling the cloth; for else it may be, the *Plant* receiveth nourishment from the *Oyl*,

30.
Experiment
Solitary,
touching the
Commixture of
Flame and
Air, and the
great force
thereof.

Flame and Air do not mingle, except it be in an *Instant*; or in the *Vital Spirits* of *Vegetables*, and *Living Creatures*. In *Gunpowder*, the force of it hath been ascribed to rarefaction of the earthly substance into *Flame*. And thus far it is true; and then (forsooth) it is become another Element the form whereof occupieth more place; and so, of Necessity, followeth a Dilatation: And therefore, lest two Bodies should be in one place, there must needs also follow an Expulsion of the Pellet, or blowing up of the Mine. But these are crude and ignorant speculations: For *Flame*, if there were nothing else, except it were in very great quantity, will be suffocate with any hard body, such as a Pellet is, or the Barrel of a Gun; so as the *Flame* would not expel the hard Body, but the hard Body would kill the *Flame*, and not suffer it to kindle, or spread. But the cause of this so potent a motion is the *Nitre* (which we call otherwise *Salt-Peter*) which having in it a notable crude and windy *Spirit*, first by the Heat of the Fire suddenly dilateth it self; (and we know that simple *Air*, being preternaturally attenuated by Heat, will make it self room, and break, and blow up that which resisteth it,) And secondly, when the *Nitre* hath dilated it self, it bloweth abroad the *Flame* as an inward Bellows. And therefore we see that *Brimstone*, *Pitch*, *Champhire*, *Wildfire*, and divers other inflammable matters; though they burn cruelly, and are hard to quench, yet they make no such fiery wind, as *Gunpowder* doth: And on the other side, we see that *Quick-silver* (which is a most crude and watry Body) heated, and pent in, hath the like force with *Gunpowder*. As for *Living Creatures*, it is certain, their *Vital Spirits* are a substance compounded of an *Airy* and *Flamy* matter; and though *Air* and *Flame*, being free, will not well mingle; yet bound in by a Body that hath some fixing, they will. For that you may best see in those two Bodies (which are their *Aliments*) *Water* and *Oyl*; for they likewise will not well mingle of themselves, but in the Bodies of *Plants*, and

and *Living Creature*, they will. It is no marvel therefore, that a small *Quantity of Spirits*, in the Cells of the Brain, and Cannals of the Sinews, are able to move the whole *Body* (which is of so great mass) both with so great force: as in wrestling, Leaping; and with so great swiftness, as in playing Division upon the *Lute*: Such is the force of these two Natures, *Air* and *Flame* when they incorporate.

TAKE a small *Wax-Candle*, and put it in a Socket of Brass or Iron, then set it upright in a Porringer full of *Spirit of Wine*, heated; then set both the *Candle*, and *Spirit of Wine* on fire, and you shall see the *Flame* of the *Candle* open it self, and become four or five times bigger then otherwise it would have been, and appear in figure *Globular*, and not in *Pyramis*. You shall see also, that the inward *Flame* of the *Candle* keepeth colour, and doth not wax any whit blew towards the colour of the outward *Flame* of the *Spirit of Wine*. This is a noble *Instance*, wherein two things are most remarkable; the one, that one *Flame* within another quencheth not, but is a fixed *Body*, and continueth as *Air* or *Water* do, and therefore *Flame* would still ascend upwards in one greatness, if it were not quenched on the sides; and the greater the *Flame* is at the bottom, the higher is the rise. The other that *Flame* doth not mingle with *Flame*, as *Air* doth with *Air*, or *Water* with *Water*, but onely remaineth contiguous; as it cometh to pass betwixt *Consisting Bodies*. It appeareth also, that the form of a *Pyramis* in *Flame*, which we usally see, is meerly by accident, and that the *Air* about, by quenching the sides of the *Flame*, crusheth it, and extenuateth it into that form; for of it self, it would be round: And therefore *Smoak* is in the figure of a *Pyramis* reversed; for the *Air* quencheth the *Flame* and receiveth the *Smoak*. Note also, that the *Flame* of the *Candle*, within the *Flame* of the *Spirit of Wine*, is troubled, and doth not only open and move upwards, but moveth waving, and to and fro: As if *Flame* of his own Nature (if it were not quenched) would roul and turn as well as move upwards. By all which it should seem, that the *Celestial Bodies* (most of them) are true *Fires* or *Flames*, as the *Stoicks* held; more fine (perhaps) and rarified, than our *Flame* is. For they are all *Globular* and *Determinate*, they have *Rotation*, and they have the colour and splendor of *Flame*: So that *Flame* above, is durable and consistent, and in his natural place; but with us, it is a stranger, and momentany, and impure, like *Vulcan* that halted with his fall.

TAKE an *Arrow*, and hold it in *Flame* for the space of ten Pulses; and when it cometh forth, you shall find those parts of the *Arrow* which were one the outsides of the *Flame*, more burned, blacked, and turned almost into a Coal; whereas that in the midst of the *Flame*, will be as if the fire had scarce touched it. This is an *instance* of great consequence for the discovery of the nature of *Flame*, and sheweth manifestly, that *Flame* burneth more violently towards the sides, then in the midst: And, which is more, that *Heat* or *Fire* is not violent or furious, but where it is checked and pent. And therefore the *Peripateticks* (howsoever their opinion of an *Element* of *Fire*, above the *Air*, is justly exploded) in that point they acquit themselves well: For being opposed, that if there were a *Sphere* of *Fire*, that encompassed the earth so near hand, it were impossible, but all things should be burnt up; they answer, that the pure *Elemental Fire*, in his own place, and not irritate, is but of a moderate heat.

31.
Experiment
Solitary,
touching the
Secret Nature
of Flame.

32.
Experiments
Solitary,
touching the
Different force
of Flame in the
midst, and on
the sides.

It

33.
Experiment
Solitary,
touching the
Decrease of the
Natural Mo-
tion of Gravi-
ty in great
distance from
the Earth; or
in some
depth of the
Earth.

It is affirmed constantly by many, as an usual experiment, That a *Lump of Ire*, in the *Bottom* of a Mine, will be tumbled and stirred, by two Mens strength; which if you bring it to the *Top* of the *Earth*, will ask six Mens strength at the least to stir it. It is a noble instance, and is fit to be tryed to the full: For it is very probable, that the *Motion of Gravity* worketh weakly, both far from the Earth, and also within the Earth: The former, because the appetite of Union of Dense Bodies with the Earth, in respect of the distance is more dull. The latter, because the Body hath in part attained his nature, when it is some depth in the Earth. For as for the moving to a point or place (which was the opinion of the Ancients) it is a meer vanity.

34.
Experiment
Solitary,
touching the
Contraction of
bodies in Bulk,
by the mixture
of the more
Liquid Body,
with the more
Solid.

It is strange, how the *Ancients* took up *Experiments* upon credit, and yet did build great Matters upon them. The observation of some of the best of them, delivered confidently, is, That a *Vessel* filled with *Ashes*, will receive the like quantity of *Water*, that it would have done if it had been empty. But this is utterly untrue, for the *Water* will not go in by a fifth part; and I suppose, that that fifth part is the difference of the lying close, or open of the *Ashes*; as we see, that *Ashes* alone, if they be hard pressed, will lie in less room; and so the *Ashes* with Air between, lie looser, and with *Water* closer. For I have not yet found certainly, that the *Water* it self by mixture of *Ashes* or Dust, will shrink or draw into less room.

35.
Experiment
Solitary,
touching the
Making Veines
more fruitful.

It is reported of credit, That if you lay good store of *Kernels of Grapes*, about the *Root* of a *Vine* it will make the *Vine* come earlier, and prosper better. It may be tried with other *Kernels*, laid about the *Root* of a *Plant* of the same kind; as *Figs*, *Kernels of Apples*, &c. The cause may be, for that the *Kernels* draw out of the Earth Juice fit to nourish the *Tree*, as those that would be *Trees* of themselves, though they were no *Root*; but the *Root* being of greater strength, robbeth and devoureth the nourishment, when they have drawn it; as great *Fishes* devour little.

36.
Experiments
in Consort,
touching
Purging Me-
dicines.

The operation of *Purging Medicines*, and the *Causes* thereof, have been thought to be a great Secret; and so according to the slothful manner of men, it is referred to a *Hidden Propriety*, a *Specificall Vertue*, and a *Fourth Quality*; and the like shifts of Ignorance. The *Causes* of *Purging* are divers, All plain and perspicuous, and thoroughly maintained by experience. The first is, That whatsoever cannot be overcome and digested by the *Stomack*, is by the *Stomack*, either put up by *Vomit*, or put down to the *Guts*; and by that *Motion of Expulsion* in the *Stomack* and *Guts*, other *Parts of the Body* (as the *Orifices* of the *Veins*, and the like) are moved to expel by *Consent*: For nothing is more frequent then *Motion of Consent* in the *Body of Man*. This Surcharge of the *Stomack*, is caused either by the *Quality* of the *Medicine*, or by the *Quantity*. The *Qualities* are three, *Extream bitter*, as in *Aloes*, *Colequintida*, &c. *Loathsome*, and of horrible taste, as in *Agarick*, *Black Hellebore*, &c. And of *secret Malignity*, and disagreement towards *Mans Body*, many times not appearing much in the taste, as in *Scammony*, *Mechoacham*, *Antimony*, &c. And note well, that if there be any *Medicine* that *Purgeth*, and hath neither, of the first two *Manifest Qualities*, it is to be held suspected as a kind of *Poyson*; For that it worketh either by *Corrosion* or by a *secret Malignity*, and Enmity to *Nature*; and therefore such *Medicines* are warily to be prepared and used, The *quantity* of that which is taken, doth also cause *Purging*, as we see in a great *quantity*, of *New Milk* from the Cow; yea, and a great *quantity* of *Meat*: For
Surfeits

Surfeits many times turn to *Purges*, both upwards and downwards. Therefore we see generally, that the working of *Purging Medicines* cometh two or three hours after the *Medicines* taken: For that the *Stomach* first maketh a proof, whether it can concoct them. And the like happeneth after *Surfeits*, or Milk in too great quantity.

A second cause is *Mordication* of the *Orifices* of the Parts, especially of the *Mesentery Veins*; as it is seen, that Salt, or any such thing that is sharp and biting, put into the Fundament, doth provoke the part to expel, and *Mustard* provoketh sneezing; and any sharp thing to the eyes provoketh tears. And therefore we see, that almost all *Purgers* have a kind of twitching and vellication, besides the griping which cometh of wind. And if this *Mordication* be in an over high degree, it is little better than the *Corosion* of *Poyson*; and it cometh to pass sometimes in *Antimony*, especially if it be given to Bodies not repleat with humors; for where humors abound, the humors save the parts.

The third cause is *Attraction*: For I do not deny, but that *Purging Medicines* have in them a direct force of *Attraction*; as Drawing-Plaisters have in *Surgery*: And we see *Sage* and *Bittony* bruised, *Sneezing-Powder*, and other *Powders* or *Liquors* (which the *Physitians* call *Errhines*) put into the Nose, draw *Flegm* and *Water* from the Head; and so it is in *Apoplegmatisms* and *Gargarisms* that draw the *Rheum* down by the Palat. And by this vertue, no doubt, some *Purgers* draw more one humor, and some another, according to the opinion received: As *Rubarb* draweth *Choler*, *Sean Melancholy*, *Agarack Flegm*, &c. but yet (more or less) they draw promiscuously. And note also that besides Sympathy between the *Purger* and the *Humor*, there is also another cause, why some *Medicines* draw some humor more than another; and it is, for that some *Medicines* work quicker than others; and they that draw quick, draw only the lighter, and more fluid humors; they that draw slow, work upon the more tough, and viscuous humors. And therefore, men must be ware how they take *Rubarb*, and the like, alone, familiarly; for it taketh only the lightest part of the humour away, and leaveth the Mass of Humours more obstinate. And the Like may be said of *Wormwood*, which is so much magnified.

The fourth cause is *Flatuosity*: For wind stirred, moveth to expel; and we find that (in effect) all *Purgers* have in them a raw *Spirit* or *Wind*, which is the principal cause of *Tortion* in the Stomack and Belly. And therefore *Purgers* leese (most of them) the vertue, by decoction upon the fire; and for that cause are chiefly given in Infusion, Juyce, or Powder.

The fifth cause is *Compression* or *Crushing*: As when *Water* is crushed out of a Sponge: So we see that taking cold moveth looseness by contraction of the Skin, and outward parts; and so doth Cold likewise cause Rheums and Defluctions from the Head, and some *Astringent Plaisters* crush out purulent Matter. This kind of Operation is not found in many *Medicines*: *Mirabolanes* have it, and it may be the *Barks* of *Peaches*; for this vertue requireth an *Astriction*, but such an *Astriction*, as is not grateful to the Body (for a pleasing *Astriction* doth rather bind in the humors, than expel them:). And therefore such *Astriction* is found in things of an harrish taste.

The sixth cause is *Lubrefaction* and *Relaxation*: As we see in *Medicines Emollient*, such as are *Milk*, *Honey*, *Mallows*, *Lettuce*, *Mercurial*, *Pellitory of the Wall*, and others. There is also a secret vertue of *Relaxation* of Cold; for the heat of the Body bindeth the Parts and Humors together, which

37.

38.

39.

40.

41.

Cold

Cold relaxeth: As it is seen in *Vrine*, *Blood*, *Pottage*, or the like; which if they be *cold*, break and dissolve. And by this kind of *Relaxation*, *Fear* loosneth the *Belly*; because the heat retiring inwards towards the *Heart*, the *Guts*, and other parts are relaxed; in the same manner as *Fear* also causeth trembling in the *Sinews*. And of this kind of purgers are some *Medicines* made of *Mercury*.

42. The seventh Cause is *Absterſion* which is plainly a *ſcouring off*, or *Incision* of the more *viscuous humors*, and making the *humors* more fluid, and cutting between them, and the part; as is found in *Nitrous Water* which ſcoureth *Linnen-Cloth* (ſpeedily) from the foulneſs. But this *Incision* muſt be by a *Sharpneſs*, without *Aſtriction*; which we find in *Salt*, *Wormwood*, *Oxymel*, and the like.

43. There be *Medicines* that move *Stools*, and not *Vrine*: ſome other *Vrine*, and not *Stools*. Thoſe that *Purge by ſtool*, are ſuch as enter not at all, or little into the *Meſentery Veins*; but either at the firſt, are not digeſtible by the *Stomack*, and therefore move immediately downwards to the *Guts*: or elſe are afterwards rejected by the *Meſentery Veins*, and ſo turn likewise downwards to the *Guts*; and of theſe two kinds, are moſt *Purgers*. But thoſe that move *Vrine*, are ſuch as are well digeſted of the *Stomack*, and well received alſo of the *Meſentery Veins*; ſo they come as far as the *Liver*, which ſendeth *Vrine* to the *Bladder*, as the *Whey of blood*: And thoſe *Medicines*, being opening and piercing, do fortifie the operation of the *Liver*, in ſending down the *Whey* part of the *Blood* to the *Reins*. For *Medicines Vrinative* do not work by rejection and indigeſtion, as *Solutive* do.

44. There be divers *Medicines*, which in greater quantity move *Stool*, and in ſmaller *Vrine*; and ſo contrariwiſe, ſome that in greater quantity move *Vrine*, and in ſmaller *Stool*. Of the former ſort is *Rubarb*, and ſome others. The cauſe is, for that *Rubarb* is a *Medicine*, which the *Stomack* in a ſmall quantity doth digeſt, and overcome (being not *Flatuous* nor *Loathſome*), and ſo ſendeth it to the *Meſentery Veins*; and ſo being opening, it helpeth down *Vrine*. But in a greater quantity, the *Stomack* cannot overcome it, and ſo it goeth to the *Guts*. *Pepper*, by ſome of the *Ancients*, is noted to be of the ſecond ſort; which being in ſmall quantity, moveth wind in the *Stomack* or *Guts*, and ſo expelleth by *Stool*; but being in greaer quantity, diſſipateth the wind, and it ſelf getteth to the *Meſentery Veins*, and ſo to the *Liver* and *Reins*; where, by *Heating* and *Opening*, it ſendeth down *Vrine* more plentifully.

45.
Experiments
in Conſort
touching
Meats and
Drinks, that
are moſt nour-
iſhing

WE have ſpoken of *Evacuating* of the *Body*, we will now ſpeak ſome-thing of the *filling* of it by *Reſtoratives* in *Conſumptions* and *Emaciat- ing Diſeaſes*. In *Vegetables*, there is one part that is more nourishing than another; as *Grains* and *Roots* nourish more than the *Leaves*, inſomuch as the *Order* of the *Foliatans* was put down by the *Pope*, as finding *Leaves* unable to nourish *Mans Body*. Whether there be that difference in the *Fleſh* of *Living Creatures*, is not well enquired; as whether *Livers*, and other *Entrails*, be not more nourishing than the *outward Fleſh*. We find that amongſt the *Romains* a *Goofes Liver* was a great delicacy; inſomuch as they had artificial means to make it fair, and great; but whether it were more nourishing, appeareth not. It is certain, that *Marrow* is more nourishing than *Fat*. And I conceive, that ſome diction of *Bones* and *Sinews*, ſtamped and well ſtrained, would be a very nourishing *Broth*: We find alſo, that *ſcotch Skinck* (which is a pottage of ſtrong nourishment) is made

made with the *Knees* and *Sinews* of *Beef*, but long boiled: *Jelly* also, which they use for a Restorative, is chiefly made of *Knuckles of Veal*. The *Pulp*, that is within the *Crawfish* or *Crab*, which they spice and butter, is more nourishing than the *Flesh* of the *Crab*, or *Crawfish*. The *Yolks* of *Eggs* are clearly more nourishing than the *Whites*. So that it should seem, that the parts of *Living Creatures* that lie more inwards, nourish more than the outward flesh: except it be the *Brain*, which the *Spirits* prey too much upon, to leave it any great vertue of nourishing. It seemeth for the nourishing of aged Men, or Men in Consumptions, some such thing should be devised, as should be half *Chylus*, before it be put into the stomach.

Take two large *Capons*, perboil them upon a soft fire, by the space of an hour or more, till in effect all the Blood be gone. Add in the decoction the *Pill* of a *Sweet-Lemmon*, or a good part of the *Pill* of a *Citron*, and a little *Mace*. Cut off the *Shanks*, and throw them away; then with a good strong Chopping-knife, mince the two *Capons*, Bones and all, as small as ordinary minced Meat; put them into a large neat Boulter, then take a Kilderkin, sweet, and well seasoned, of four Gallons of Beer of Eight shillings strength, new as it cometh from the Tunning; make in the Kilderking a great Bung-hole of purpose, then thrust into it, the Boulter (in which the *Capons* are) drawn out in length; let it steep in it three days and three nights, the Bung-hole open to work, then close the Bung-hole, and so let it continue a day and a half, then draw it into Bottles, and you may drink it well after three days Bottling, and it will last six weeks (approved). It drinketh fresh, flowreth, and mantleth exceedingly, it drinketh not newish at all, it is an excellent drink for a Consumption to be drunk either alone, or carded with some other Beer. It quencheth thirst, and hath no whit of windiness. Note, that it is not possible, that Meat and Bread, either in Broths, or taken with Drink, as is used, should get forth into the Veins, and outward Parts, so finely, and easily, as when it is thus incorporate, and made almost a *Chylus* aforehand.

Tryal would be made of the like Brew with *Potato-Roots*, or *Bur-Roots*, or the *Pith* of *Artichokes*, which are nourishing Meats: It may be tryed also, with other flesh, as *Pheasant*, *Partridge*, *Young Pork*, *Pig*, *Venison*, especially of *Young Deer*, &c.

A *Mortress* made with the *Brawn* of *Capons*, stamped and strained, and mingled (after it is made) with like quantity, (at the least,) of *Almond Butter*, is an excellent Meat to nourish those that are weak, better than *Blanck-Manger* or *Jelly*. And so is the *Cullice* of *Cocks*, boiled thick with the like mixture of *Almond Butter*: For the *Mortress* or *Cullice* of it self is more savory and strong, and not so fit for nourishing of weak Bodies, but the *Almonds* that are not of so high a taste as flesh, do excellently qualifie it.

Indian Maiz hath (of certain) an excellent Spirit of Nourishment, but it must be thoroughly boiled, and made into a *Maiz-Cream* like a *Barley-Cream*. I judge the same of *Rice*, made into a Cream; for *Rice* is in *Turky*, and other Countreys of the East, most fed upon, but it must be thoroughly boiled in respect of the hardness of it; and also, because otherwise it bindeth the Body too much.

Pistachoes, so they be good and not musty, joyned with *Almonds* in *Almond Milk*, or made into a *Milk* of themselves like unto *Almond Milk* but more green, are an excellent nourisher. But you shall do well, to add a little *Ginger* scraped, because they are not without some subtil windiness.

51.

Milk warm from the Cow, is found to be a great nourisher, and a good remedy in *Consumptions*: But then you must put into it, when you Milk the Cow, two little Bags; the one of *Powder of Mint*, the other of *Powder of Red Roses*; for they keep the *Milk* somewhat from turning, or cruddling in the Stomack; and put in Sugar also for the same cause, and partly for the tastes sake: But you must drink a good draught, that it may stay less time in the Stomack, lest it cruddle: And let the Cup, into which you milk the Cow, be set in a greater Cup of hot Water, that you may take it warm. And *Cow-milk* thus prepared, I judge to be better for a *Consumption* than *Ass-milk*, which (it is true) turneth not so easily, but it is a little harsh: Marry it is more proper for sharpness of Urine, and Exulceration of the Bladder, and all manner of Lenifyings. *Womans-milk* likewise is prescribed, when all fail; but I commend it not, as being a little too near the Juyce of Mans Body, to be a good nourisher; except it be in *Infants*, to whom it is natural.

52.

Oyl of sweet Almonds newly drawn, with *Sugar* and a little *Spice*, spread upon Bread toasted, is an excellent nourisher: but then to keep the *Oyl* from frying in the Stomack, you must drink a good draught of Mild-beer after it; and to keep it from relaxing the Stomack too much, you must put in a little *Powder of Cinnamon*.

53.

The Yolks of Eggs are of themselves so well prepared by *Nature* for nourishment, as (so they be potched, or Rear boyled) they need no other preparation or mixture; yet they may be taken also raw, when they are new laid, with *Marmsey* or *Sweet Wine*; you shall do well to put in some few slices, of *Eringium Roots*, and a little *Amber-greece*: For by this means, besides the immediate faculty of nourishment, such drink will strengthen the Back, so that it will not draw down the *Urine* too fast. For too much *Urine* doth always hinder nourishment.

54.

Mincing of Meat, as in *Pies*, and *Buttered minced Meat*, saveth the grinding of the Teeth; and therefore (no doubt) it is more nourishing, especially in Age, or to them that have weak Teeth; but the Butter is not so proper for weak Bodies, and therefore it were good to moisten it with a little *Claret Wine*, *Pill of Lemmon* or *Orange* cut small, *Sugar*, and a very little *Cinnamon* or *Nutmeg*. As for *Chueys*, which are likewise Minced-meat; instead of Butter, and Fat, it were good to moisten them, partly with *Cream* or *Almond*, or *Pistachomilk*, or *Barley*, or *Maiz Cream*; adding a little *Coriander-seed*, and *Carrawayseed*, and a very little *Saffron*. The more full handling of *Alimentation*, we reserve to the due place.

We have hitherto handled the Particulars, which yield best, and easiest, and plentifullest Nourishment; and now we will speak of the best Means of conveying and converting the Nourishment.

55.

The first Means is to procure, that the *Nourishment* may not be robbed and drawn away; wherein that which we have already said, is very material, to provide, that the *Reins* draw not too strongly an over-great part of the *Blood* into *Urine*. To this add that Precept of *Aristotle*, That *Wine* be forboren in all *Consumptions*; for that the *Spirits* of the *VVine* do prey upon the *Rosside Juyce* of the Body, inter-common with the *Spirits* of the Body; and so deceive and rob them of their Nourishment. And therefore if the *Consumption*, growing from the weakness of the Stomack, do force you to use *VVine*; let it always be burnt, that the quicker *Spirits* may evaporate, or (at the least) quenched with too little *Wedges of Gold*, six or seven times repeated. Add also this Provision, that there be not too much expence of

of the *Nourishment*, by *Exhaling* and *Sweating*: And therefore if the Patient be apt to sweat, it must be gently restrained. But chiefly *Hypocrates* Rule is to be followed, who adviseth quite contrary to that which is in use: Namely, That the *Linnen* or *Garment* next the *Flesh*, be in Winter dry and oft changed; and in Summer seldom changed, and smeared over with *Oyl*: For certain it is, that any substance that is fat, doth a little fill the Pores of the Body, and stay Sweat in some degree. But the more cleanly way is to have the *Linnen* smeared lightly over with *Oyl* of *Sweet Almonds*, and not to forbear shifting as oft as is fit.

The second *Means* is to send forth the *Nourishment* into the *Parts* more strongly, for which, the working must be by *Strengthening* of the *Stomack*; and in this, because the *Stomack* is chiefly comforted by *Wine* and *Hot Things*, which otherwise hurt, it is good to resort to *Outward Applications* to the *Stomack*: Wherein it hath been tryed, that the *Quilt* of *Roses*, *Spices*, *Mastick*, *Wormwood*, *Mint*, &c. are nothing so helpful, as to take a *Cake* of *New-Bread*, and to be dew it with a little *Sack* or *Alegant*, and to dry it, and after it be dryed a little before the Fire, to put it within a clean *Napkin*, and to lay it to the *Stomack*: For it is certain, that all *Flower* hath a potent *Vertue* of *Astriction* inso much, as it hardneth a piece of *Flesh*, or a *Flower* that is laid in it. And therefore a *Bag* quilted with *Bran*, is likewise very good, but it dryeth somewhat too much, and therefore it must not lie long.

The third *Means* (which may be a branch of the former) is to send forth the *Nourishment* the better by *Sleep*. For we see, that *Bears* and other *Creatures* that *Sleep* in the Winter, wax exceeding fat: And certain it is, (as it is commonly believed) that *Sleep* doth nourish much, both for that the *Spirits* do less spend the nourishment in *Sleep*, than when living *Creatures* are awake: And because (that which is to the present purpose) it helpeth to thrust out the nourishment into the parts. Therefore in aged-men, and weak bodies, and such as abound not with *Choler*, a short *Sleep* after dinner doth help to nourish; for in such Bodies there is no fear of an over-hasty digestion, which is the inconvenience of *Post-meridian Sleepes*. *Sleep* also in the morning, after the taking of somewhat of easie digestion; as *Milk* from the Cow, nourishing *Broth*, or the like, doth further nourishment: But this would be done sitting upright that the *Milk* or *Broth* may pass the more speedily to the bottom of the *Stomack*.

The fourth *Means* is to provide, that the parts themselves may draw to them the nourishment strongly. There is an excellent observation of *Aristotle*, that a great reason why *Plants* (some of them) are of greater age than *Living Creatures* is, for that they yearly put forth new *Leaves* and *boughs*; whereas *Living Creatures* put forth (after their period of growth) nothing that is young, but *Hair* and *Nails*, which are excrements, and no *Parts*. And it is most certain, that whatsoever is young, doth draw nourishment better, than that which is old; and then (that which is the mystery of that observation) young *Boughes* and *Leaves*, calling the Sap up to them, the same nourisheth the *Body* in the passage. And this we see notably proved also, in that the oft cutting or pulling of *Hedges*, *Trees*, and *Herbs*, doth conduce much to their lasting. Transfer therefore this observation to the helping of nourishment in *Living Creatures*: The Noblest and Principal Use whereof is, for the *Prolongation* of *Life*; *Restauration* of some degree of *Youth*, and *Inteneration* of the *Parts*: For certain it is, that there are in *Living Creatures* *Parts* that nourish and repair easily, and parts that

nourish and repair hardly; and you must refresh, and renew those that are easie to nourish, that the other may be refreshed, and (as it were) drink in nourishment in the passage. Now we see that *Draught Oxen* put into good Pasture, recover the Flesh of young Beef; and Men after long emaciating Diets, wax plump and fat, and almost new: So that you may surely conclude, that the frequent and wise use of those *emaciating Diets*, and of *Purgings*; and perhaps of some kind of *Bleeding*, is a principal means of *Prolongation of Life*, and *Restoring* some degree of *Youth*: For as we have often said, *Death* cometh upon *Living Creatures* like the Torment of *Mezentius*,

Mortua quinetiam jungebat corpora vivis,

Component Manibusque Manus, atque oribus ora.

For the parts in Mans body easily repairable (as *Spirits*, *Blood*, and *Flesh*) die in the embracement of the parts hardly repairable, (as *Bones*, *Nerves*, and *Membranes*) and likewise some *Entrails* (which they reckon amongst the *Sparmatical Parts*) are hard to repair: Though that division of *Sparmatical* and *Menstrual Parts*, be but a conceit. And this same *Observation* also may be drawn to the present purpose of nourishing emaciated Bodies: And therefore *Gentle Friction* draweth forth the nourishment, by making the parts a little hungry and heating them, whereby they call forth nourishment the better. This *Friction* I wish to be done in the morning. It is also best done by the *Hand*, or a piece of *Scarlet-Wool*, wet a little with *Oyl of Almonds*, mingled with a small quantity of *Bay-Salt*, or *Saffron*: We see that the very *Currying* of *Horses* doth make them fat, and in good liking.

59.

The fifth *Means* is, to further the very *Act* of *Assimilation* of *Nourishment*; which is done by some outward *emollients*, that make the parts more apt to *Assimilate*. For which I have compounded an *Oyntment* of excellent odour, which I call *Roman Oyntment*, *vide* the *Receit*. The use of it would be between sleeps; for in the latter sleep, the parts *Assimilate* chiefly.

60.

Experiment
Solitary
touching the
Filum Medi-
cinale.

There be many *Medicines*, which by themselves would do no cure but perhaps hurt, but being applied in a certain order, one after another, do great cures. I have tried (my self) a *Remedy* for the *Gout*, which hath seldom failed, but driven it away in Twenty four hour space: It is first to apply a *Pultafs*, which, *vide* the *Receit*, and then a *Bath* or *Fomentation*, of which, *vide* the *Receit*, and then a *plaster*, *vide* the *Receit*. The *Pultafs* relaxed the Pores, and maketh the humour apt to exhale. The *Fomentation* calleth forth the Humor by Vapors; but yet in regard of the way made by the *Pultafs*, draweth gently; and therefore draweth the Humor out, and doth not draw more to it: For it is a *Gentle Fomentation*, and hath withal a mixture (though very little) of some *Stupefactive*. The *Plaster* is a moderate *Astringent Plaster*, which repelleth new humor from falling. The *Pultafs* alone would make the part more soft and weak, and apter to take the defluxion and impression of the Humor. The *Fomentation* alone, if it were too weak, without way made by the *Pultafs*, would draw forth little; if too strong, it would draw to the part, as well as draw from it. The *Plaster* alone would pen the Humor already contained in the part, and so exasperate it, as well as forbid new Humor; therefore they must be all taken in order, as is said: The *Pultafs* is to be laid to for two or three hours; the *Fomentation* for a quarter of an hour, or somewhat better, being used hot, and seven or eight times repeated; the *Plaster* to continue on still, till the part be well confirmed.

There

THere is a secret way of Cure, (unpractised) by *Assuetude* of that which in it self hurteth. *Poysons* have been made, by some, Familiar, as hath been said. *Ordinary keepers* of the sick of the *Plague*, are seldom infected. *Enduring* of *Tortures*, by *custom*, hath been made more easie: The *brooking* of enormous quantity of *Meats*, and so of *Wine*, or *strong drink*, hath been, by *custom*, made to be without *Surfeit* or *Drunkenness*. And generally *Diseases* that are *Chronical*, as *Coughs*, *Phthisicks*, some kind of *Palsies*, *Lunacies*, &c. are most dangerous at the first: Therefore a wise *Physitian* will consider, whether a *Disease* be incurable, or whether the just cure of it be not full of peril; and if he find it to be such, let him resort to *Palliation*, and alleviate the *Symptom* without busying himself too much with the perfect cure: And many times (if the *Patient* be indeed patient) that course will exceed all expectation. Likewise the *Patient* himself may strive, by little and little to overcome the *Symptom* in the *Exacerbation*, and so, by time, turn suffering into Nature.

61.
Experiment
Solitary,
touching the
Cure by Cu-
stom.

Divers *Diseases*, especially *Chronical*, (such as *Quartan Agues*) are sometimes cured by *Surfeits* and *excesses*; as *excess* of *Meat*, *excess* of *Drink*, *extraordinary Fasting*, *extraordinary Stirring*, or *Lassitude*, and the like. The cause is, for that *Diseases* of *Continuance*, get an adventitious strength from *Custom*, besides their *material cause* from the *Humors*: So that the *breaking* of the *Custom* doth leave them onely to their first cause; which, if it be any thing weak, will fall off: Besides, such *Excesses* do excite and spur *Nature*, which whereupon riseth more forcible against the *Disease*.

62.
Experiment
Solitary
touching
Cure by Ex-
cess.

THere is in the Body of Man, a great *consent* in the *Motion* of the several parts: We see it is *Childrens* sport, to prove whether they can rub upon their breast with one hand, and pat upon their Forehead with another; and straight ways they shall sometimes rub with both hands, or pat with both hands. We see, that when the *Spirits* that come to the *Nostrils*, expel a bad sent, the *Stomack* is ready to expel by vomit. We find that in *Consumptions* of the *Lungs*, when Nature cannot expel by *Cough*, Men fall into *Fluxes* of the *Belly*, and then they die. So in *Pestilent Diseases*, if they cannot be expelled by *Sweat*, they fall likewise into *Loosness*, and that is commonly *Mortal*. Therefore *Physicians* should ingeniously contrive, how by *Motions* that are in their *Power* they may excite *inward Motions* that are not in their *Power* by *consent*; as by the *stench* of *Feathers*, or the like, they cure the *Rising* of the *Mother*.

63.
Experiment
Solitary
touching
Cure by Mo-
tion of Consen.

Hippocrates *Aphorism*, in *morbis minus*, is a good profound *Aphorism*. It importeth, that *Diseases* contrary to the *Complexion*, *Age*, *Sex*, *Season of the year*, *Diet*, &c. are more dangerous than those that are concurrent. A Man would think it should be otherwise; For that when the *Accident* of *Sickness*, and the *Natural disposition*, do second the one the other; the *Disease* should be more forcible. And so (no doubt) it is, if you suppose like quantity of *Matter*. But that which maketh good the *Aphorism*, is, because such *Diseases* do shew a greater collection of *Matter*, by that they are able to overcome those *Naturel inclinations* to the contrary. And therefore in *Diseases* of that kind, let the *Physitian* apply himself more to *Purgation*, than to *Alteration*; because the offence is in the *Quantity*, and the qualities are rectified of themselves.

64.
Experiment
Solitary
touching
Cure of Dis-
eases which are
contrary to
Predisposition

65.

Experiment
Solitary,
touching
Preparations
before Purg-
ing, and set-
ling of the Bo-
dy afterward.

Physitians do wisely prescribe, that there be *Preparatives* used before *Just Purgations*; for certain it is, that *Purgers* do many times great hurt, if the Body be not accommodated; both before and after the *Purging*. The hurt that they do, for want of *Preparation* before *Purging*, is by the sticking of the Humors, and their not coming fair away; which causeth in the Body great perturbations, and ill accidents, during the *Purging*; and also the diminishing and dulling of the working of the *Medicine* it self, that it purgeth not sufficiently: Therefore the work of *Preparation* is double, to make the *Humors* *fluide* and mature, and to make the *Passages* more open; For both those help to make the Humors pass readily: And for the former of these, *Syrups* are most profitable; and for the latter, *Apozums* or *Preparing Broths*; *Clysters* also help lest the *Medicine* stop in the Guts, and work gripingly. But it is true, that *Bodies* abounding with *Humors*. And *fat Bodies*, and *open Weather*, are *Preparatives* in themselves; because they make the Humors more fluid: But let a *Physitian* beware how he purge after hard *Frosty Weather*, and in a *lean Body*, without *Preparation*. For the hurt that they may do after *Purging*, it is caused by the *ledging* of some *Humors* in *ill places*, for it is certain, that there be *Humors*, which somewhere placed in the Body, are quiet, and do little hurt; in other places (especially *Passages*) do much mischief. Therefore it is good after *Purging*, to use *Apozums* and *Broths*, not so much *opening* as those used before *Purging* but *Abstusive* and *Mundifying*, *Clysters* also are good to conclude with, to draw away the reliicks of the Humours that may have descended to the *lower region* of the Body.

66.

Experiment
Solitary
touching
Stanching of
Blood.

Blood is stanch'd divers ways: First, by *Astringents* and *Repercussive Medicines*. Secondly, by *drawing* of the *Spirits* and *Blood* inwards, which is done by *Cold*; as *Iron* or *Stone* laid to the Neck doth stanch the *Bleeding* of the Nose; also it hath been tried, that the *Testicles* being put into sharp *Vinegar*, hath made a sudden recess of the *Spirits*, and stanch'd *Blood*. Thirdly, by the *Recess* of the *Blood* by *Sympathy*; so it hath been tried, that the part that bleedeth, being thrust into the body of a *Capon*, or *Sheep*, new ript and bleeding hath stanch'd *Blood*; the *Blood*, as it seemeth, sucking and drawing up, by similitude of substance, the *Blood* it meeteth with, and so it self going back. Fourthly, by *Custom* and *Time*; so the Prince of *Aurange*, in his first hurt by the *Spanish Boy*, could find no means to stanch the *Blood*, either by *Medicine* or *Ligament*, but was fain to have the *Orifice* of the *Wound* stopped by *Mens Thumbs*, succeeding one another for the space, at the least, of two days; and at the last the *Blood* by *custom* onely retired. There is a fifth way also in use, to let *Blood* in an *adverse part* for a *Revulsion*.

67.

Experiment
Solitary
touching
Change of Ali-
ments and me-
dicines.

IT helpeth, both in *Medicine* and *Aliment*, to change and not to continue the same *Medicine* and *Aliment* stills. The cause is, for that *Nature* by continual use of any thing, groweth to a *satiety* and *dulness*, either of *Appetite* or *Working*. And we see that *Assuetude* of *things hurtful*, doth make them leese their force to hurt; As *Poyson*, which with use some have brought themselves to brook. And therefore it is no marvel, though *things helpful* by *custom*, leese their force to help, I count *intermission* almost the same thing with *change*; for that, that hath been intermitted, is after a sort new.

IT is found by experience, that in *Diets of Guaiacum, Sarza, and the like,* (especially, if they be strict) the *Patient* is more troubled in the beginning than after continuance; which hath made some of the more delicate sort of *Patients*, give them over in the midst; Supposing, that if those *Diets* trouble them so much at first, they shall not be able to endure them to the end. But the cause is, for that all those *Diets*, do dry up *Humors, Rheums* and the like; and they cannot dry up until they have first attenuated: And while the *Humor* is attenuated, it is more fluid, than it was before, and troubleth the Body a great deal more, until it be dried up, and consumed. And therefore *Patients* must expect a due time, and not check at them at the first.

68.
Experiment
Solitary
touching
Diets.

THe Producing of Cold is a thing very worthy the Inquisition, both for use and disclosure of causes. For *Heat and Cold* are *Natures* two hands, whereby she chiefly worketh; and *Heat* we have in readiness, in respect of the *Fire*: But for *Cold*, we must stay till it cometh, or seek it in deep Caves, or high Mountains; and when all is done, we cannot obtain it in any great degree: For *Furnaces of Fire* are far hotter than a *Summers Sun*, but *Vaults or Hills* are not much colder than a *Winters Frost*.

Experiment
in Consort
touching
Production of
Cold.

The first *Means of Producing cold*, is that which *Nature* presenteth us withal; namely, the *Expiring of Cold* out of the *Inwards parts of the Earth* in *Winter*, when the *Sun* hath no power to overcome it; the *Earth* being (as hath been noted by some) *Primum Frigidum*. This hath been asserted as well by *Ancient*, as by *Modern Philosophers*: It was the tenet of *Parmenides*: it was the opinion of the *Author of the Discourse in Plutarch*, (for I take it, that Book was not *Plutarchs* own) *De primo Frigido*. it was the opinion of *Telestus*, who hath renewed the *Philosophy of Parmenides*, and is best of the *Novelists*.

69.

The second *Cause of Cold* is, the *Contract of Cold Bodies*; for *Cold* is *Active and Transitive* into *Bodies adjacent*, as well as *Heat*; which is seen in those things that are touched with *snow or Cold Water*. And therefore, whosoever will be an *Enquirer in Nature*, let him resort to a *Conservatory of Snow and Ice*; such as they use for delicacy, to cool *Wine* in *Summer*: Which is a poor and contemptible use, in respect of other uses that may be made of such *Conservatories*.

70.

The third *Cause* is the *Primary Nature of all Tangible Bodies*; for it is well to be noted, That all things whatsoever (*Tangible*) are of themselves *Cold*; except they have an accessory *Heat by Fire, Life, or Motion*: For even the *Spirit of Wine, or Chymical Oyls*, which are so hot in operation, are to the first touch, *Cold*; and *Air* it self compressed, and condensed a little by blowing, is *Cold*.

71.

The fourth *Cause* is, the *Density of the Body*, for all *Dense Bodies* are *Colder* than most other *Bodies*, as *Metals, Stone, Glass*, and they are longer in *Heating* than *safter Bodies*. And it is certain, that *Earth, Dense, Tangible*, being *Cold*, it must needs follow, that were the *Matter* is most congregate the *Cold* is the greater.

72.

The fifth *Cause of Cold*, or rather of increase and vehemency of *Cold*, is A *Quick Spirit inclosed in a cold Body*; as will appear to any that shall attentively consider of *Nature* in many instances. We see *Nitre* (which hath a *Quick Spirit*) is *Cold*, more *Cold* to the *Tongue* than a *Stone*; so *Water*

73.

is colder than Oyl, because it hath a quicker Spirit; for all Oyl, though it hath the tangible parts better digested than Water, yet hath it a duller Spirit. So Snow is colder than Water, because it hath more Spirit within it: So we see that Salt put to Ice (as in the producing of the Artificial Ice) encreaseth the activity of cold: So some Insecta which have Spirit of Life, as Snakes and Silkworms, are to the touch, Cold. So Quick-silver is the coldest of Metals, because it is fullest of Spirit,

74.

The sixth cause of Cold is, the chasing and driving away of Spirits, such as have some degree of Heat; for the banishing of the Heat must needs leave any Body cold. This we see in the operation of Opium, and Stupratives upon the Spirits of Living Creatures; and it were not amiss to try Opium to laying it upon the top of a Weather-Glass, to see whether it will contract the Air, but I doubt it will not succeed: For besides that, the virtue of Opium will hardly penetrate thorow such a body as Glass, I conceive that Opium, and the like, make the Spirits flee rather by Malignity, than by Cold.

75.

Seventhly, the same effect must follow upon the exhaling or drawing out of the warm Spirits, that doth upon the flight of the Spirits. There is an opinion, that the Moon is Magnetical of Heat, as the Sun is of Cold, and Moisture: It were not amiss therefore to try it with warm waters; the one exposed to the Beams of the Moon, the other with some screen betwixt the Beams of the Moon and the Water: As we use to the Sun for shade, and to see whether the former will cool sooner. And it were also good to enquire, what other means there may be, to draw forth the exile heat which is in the Air; for that may be a secret of great power to produce cold Weather,

76.

Experiment
in Consort
touching the
Version and
Transmutation
of Air in-
to water.

WE have formerly set down the Means of turning Air into Water, in the Experiment 27. But because it is Magnale Natura, and tendeth to the subduing of a very great effect, and is also of manifold use: We will add some instances in Consort that give light thereunto.

It is reported by some of the Ancients, that Sailors have used every night, to hang Fleeces of Wool on the sides of their Ships, the Water towards the Water; and that they have crushed fresh water out of them in the Morning, for their use. And thus much we have tried, that a quantity of Wool, tied loose together, being let down into a deep Well; and hanging in the middle, some three Fathom from the Water for a night in the Winter time, increased in weight, (as I now remember) to a fifth Part.

77.

It is reported by one of the Ancients, that in Lydia near Pergamus there were certain Vorkmen in time of Wars, fled into Caves; and the Mouth of the Caves being stopped by the Enemies, they were famished. But long time after the dead Bodies were found, and some vessels which they had carried with them, and the Vessels full of Water; and that Water thicker, and more towards Ice, than common Water; which is a notable instance of Condensation and Induration by Burial under Earth (in Caves) for long time; and of Version also (as it should seem) of Air into Water; if any of those Vessels were empty. Try therefore a small Bladder hung in Snow, and the like in Nitre, and the like in Quick-silver: And if you find the Bladders fawn or shrunk, you may be sure the Air is condensed by the Cold of those Bodies, as it wold be in a Cave under Earth,

It

It is reported of very good credit, that in the *East-Indies* if you set a Tub of *Water* open in a Room where *Cloves* are kept, it will be drawn dry in Twenty four hours, though it stand at some distant from the *Cloves*. In the Countrey, they use many times in deceit, when their *Wool* is new shorn, to set some Pails of *Water* by in the same Room, to encrease the weight of the *Wool*: But it may be, that the Heat of the *Wool* remaining from the Body of the Sheep, or the heat gathered by the lying close of the *Wool* helpeth to draw the watry vapor; but that is nothing to the *Version*.

78.

It is reported also credibly, that *Wool* new shorn, being laid casually upon a *Vessel* of *Verjuice*, after some time hath drunk up a great part of the *Verjuice*, though the *Vessel* were whole without any flaw, and had not the Bung-hole open. In this *Instance* there is (upon the by) to be noted, the *Percolation* or *Suing* of the *Verjuice* thorow the *Wood*; for *Verjuice* of it self would never have passed through the *Wood*: So as it seemeth, it must be first in a kind of vapor before it pass.

79.

It is especially to be noted, that the cause that doth facilitate the *Version* of *Air* into *Water*, when the *Air* is not in gross, but subtilty mingled with *Tangible Bodies*, is, (as hath been partly touched before) for that *Tangible Bodies* have an antipathy with *Air*; and if they find any *Liquid Body* that is more dense near them, they will draw it; and after they have drawn it, they will condense it more, and in effect incorporate it: For we see that a *Sponge* or *Wool*, or *Sugar*, or a *Woolen Cloth*, being put but in part, in *Water* or *Wine*, will draw the *Liquor* higher, and beyond the place, where the *Water* or *Wine* cometh. We see also, that *Wood*, *Lute-strings*, and the like, do swell in moist seasons; as appeareth by the *Breaking* of the *Strings* the *Hard turning* of the *Pegs*, and the *Hard drawing forth* of *Boxes*, and *Opening* of *Wainscot doors*, which is a kind of *infusion*; and is much like to an *Infusion* in *Water*, which will make *Wood* to swell; as we see in the filling of the *Chops* of *Bowls* by laying them in *Water*. But for that part of these *Experiments*, which concerneth *Attraction* we will reserve to the proper *Title* of *Attraction*.

80.

There is also a *Version* of *Air* into *Water*, seeing in the *Sweating* of *Marbles*, and other *Stones*; and of *Wainscot* before, and in moist weather. This must be, either by some *Moisture* the *Body* yieldeth, or else by the moist *Air* thickned against the hard *Body*. But it is plain, that it is the latter; for that we see *Wood* painted with *Oyl-colour*, will sooner gather drops in a moist night, than *Wood* alone; which is caused by the smoothness and closeness which letteth in no part of the vapor, and so turneth it back, and thickneth it into *Dew*. We see also, that *Breathing* upon a *Glass*, or smooth *Body*, giveth a *Dew*; and in *Frosty mornings* (such as we call *Rime Frosts*) you shall find drops of *Dew* upon the inside of *Glass-windows*. And the *Frost* it self upon the ground, is but a *Version* or *Condensation* of the moist vapors of the night, into a watry substance; *Dews* likewise, and *Rain*, are but the returns of moist vapors condensed; the *Dew*, by the cold onely of the *Suns* departure, which is the gentler *Cold*; *Rains*, by the *Cold* of that which they call the *Middle Region* of the *Air*, which is the more violent *Cold*.

81.

It is very probable (as hath been touched) that that which will turn *Water* into *Ice*, will likewise turn *Air* some degree nearer unto *Water*. Therefore try the *Eperiment* of the *Artificial turning* *Water* into *Ice* (whereof we shall speak in another place) with *Air* in place of *Water*, and the

82.

Experiments
in Consort
touching the
Induration of
Bodies.

the *Ice* about it. And although it be a greater alteration to turn *Air* into *Water*, than *Water* into *Ice*; yet there is this hope, that by continuing the *Air* longer time, the effect will follow; for that artificial *Conversion* of *Water* into *Ice*, is the work of a few hours; and this of *Air* may be tried by a moneths space, or the like.

Induration or *Lapidification*, of Substances more soft, is likewise another degree of *Condensation*, and is a great *Alteration* in Nature. The effecting and accelerating thereof, is very worthy to be enquired. It is effected by three means.

The first is by *Cold*, whose property is to *Condense*, and constipate, as hath been said.

The second is by *Heat*, which is not proper but by consequence; for the heat doth attenuate, and by attenuation doth send forth the Spirit, and moister part of a Body; and upon that, the more gross of the tangible parts do contract and serve themselves together, both to avoid *Vacuum* (as they call it) and also to munite themselves against the force of the *Fire*, which they have suffered.

And the third is by *Assimilation*, when a hard Body assimilateth a soft, being contiguous to it.

The examples of *Induration* taking them promiscuously, are many: As the Generation of *Stones* within the Earth, which at the first are but Rude Earth or Clay; and so of *Minerals*, which come (no doubt) at first of Juyces Concrete, which afterward indurate: And so of *Porcellane*, which is an *Artificial Cement*, buried in the Earth a long time; and so the making of *Brick* and *Tile*; also the making of *Glass*, of a certain Sand and Brake-Roots, and some other matters: also the *Exudations* of *Rock-Diamonds* and *Chrystal*, which harden with time; also the *Induration* of *Bead-Amber*, which at first is a soft substance, as appeareth by the *Flies* and *Spiders*, which are found in it, and many more. But we will speak of them distinctly.

83. For *Indurations* by *Cold*, there be few Trials of it; for we have no strong or intense cold here on the surface of the Earth, so near the Beams of the Sun and the Heavens, the likeliest trial is by *Snow* and *Ice*; for as *snow* and *Ice*, especially being holpen, and their *Cold* activated by *Nitre* or *Salt*, will turn *Water* into *Ice*, and that in a few hours: So it may be it will turn *Wood* or *Stiff Clay* into *Stone* in longer time. Put therefore into a *Conserving Pit* of *Snow* and *Ice*, (adding some quantity of *Salt* and *Nitre*) a piece of *Wood*, or a piece of *Tough Clay*, and let it lie a moneth or more.

84. Another tryal is by *Metalline Waters*, which have virtual *Cold* in them. Put therefore *Wood* or *Clay* into *Smiths water*, or other *Metalline water*, and try whether it will not harden in some reasonable time. But I understand it of *Metalline waters*, that come by washing or quenching, and not of *Strong Waters* that come by dissolution; for they are too Corrosive to consolidate.

91. It is already found, that there are some *Natural Spring waters* that will inlapidate *Wood*; so as you shall see one piece of *Wood*, whereof the part above the *Water* shall continue *Wood*; and the part under the *Water* shall be turned into a kind of *Gravelly stone*. It is likely those *Waters* are of some *Metalline Mixture*; but there would be more particular requiry made of them. It is certain, that an *Egg* was found, having lain many years in the bottom

bottom of a Moat, where the Earth had somewhat over grown it : And this Egg was coming to the hardness of a *Stone*, and had the colours of the White and Yolk perfect ; and the Shell shining in small Grains, like Sugar or Alabaster

Another experience there is of *Induration by Cold*, which is already found, which is, That *Metals* themselves are hardened by often *heating*, and *quencking* in *Cold-water* : For *Cold* ever worketh most potently upon *Heat* precedent.

86.

For *Induration by Heat*, it must be considered, That *Heat*, by the exhaling of the moister parts, doth either harden the Body ; as in *Bricks*, *Tiles*, &c. Or if the *Heat* be more fierce, maketh the grosser part it self, run and melt ; as in the making of ordinary *Glass*, and in the *Vitrification* of *Earth*, (as we see in the inner parts of Furnaces) and in the *Vitrification* of *Brick*, and of *Metals*. And in the former of these, which is the hardning by Baking, without Melting, the *Heat* hath these degrees : First, It *Indurath*, and then maketh *Fragile* ; and lastly, It doth *Incinerate* and *Calcinat*.

87.

But if you desire to make an *Induration* with *Toughness*, and less *Fragility*, a middle way would be taken, which is that which *Aristotle* hath well noted, but would be thoroughly verified. It is, to decoct *Bodies* in *Water* for two or three days ; but they must be such *Bodies*, into which the *Water* will not enter ; as *Stone* and *Metal*. For if they be bodies, into which the *Water* will enter, then long seething will rather soften than indurate them, as hath been tried in *Eggs*, &c. Therefore, softer *Bodies* must be put into *Bottles*, and the *Bottles* hung into *Water* seething, with the *Mouths* open above the *Water*, that no *Water* may get in : For by this Means, the *Virtual Heat* of the *Water* will enter ; and such a *Heat*, as will not make the Body adust or fragile ; But the Substance of the *Water* will be shut out. This *Experiment* we made, and it sorted thus, It was tryed with a piece of *Freestone*, and with *Pewter*, put into the *Water* at large ; the *Free-stone* we found received in some *Water* ; for it was softer and easier to scrape, than a piece of the same stone kept dry. But the *Pewter*, into which no *Water* could enter, become more white, and liker to *Silver*, and less flexible by much. There were also put into an Earthen Bottle, placed as before, a good pellet of *Clay*, a piece of *Cheese*, a piece of *Chalk*, and a piece of *Free-stone*. The *Clay* came forth almost of the hardness of *Stone* : The *Cheese* likewise very hard, and not well to be cut : The *Chalk*, and the *Free-stone* much harder then they were. The colour of the *Clay* inclined not a whit to the colour of *Brick*, but rather to white, as in ordinary drying by the Sun. Note, that all the former tryals were made by a boiling upon a good hot fire, renewing the *Water* as it consumed, with other hot *Water* ; but the boyling was but for Twelve hours onely : And it is like, that the *Experiment* would have been more effectual, if the boyling had been for two or three days, as we prescribed before.

88.

As touching *Assimilation* (for there is a degree of *Assimilation*, even in Inanimate Bodies) we see examples of it in some *Stones*, in *Clay grounds*, lying near to the top of the Earth where *Pebble* is ; in which you may manifestly see divers *Pebbles* gathered together, and a crust of *Cement* or *Stone* between them, as hard as the *Pebbles* themselves. And it were good to make a tryal of purpose, by taking *Clay*, and putting in it divers *Pebble-stones*, thick set, to see whether in continuance of time, it will not be harder than other *Clay* of the same lump, in which no *Pebbles* are set. We see also in Ruins of

89.

of old Walls, especially towards the bottom, the *Mortar* will become as hard as the *Brick*: We see also, that the *Wood* on the sides of *Vessels* of *Wine*, gathereth a crust of *Tartar* harder then the *Wood* it self; and *Scales* likewise grow to the *Teeth*, harder than the *Teeth* themselves.

90.

Most of all, *Induration* by *Assimilation* appeareth in the bodies of *Trees*, and *Living Creatures*: For no nourishment that the *Tree* receiveth, or that the *Living Creature* receiveth, is so hard as *Wood*, *Bone*, or *Horn*, &c. But is *indurated* after by *Assimilation*.

91.

Experiment
Solitary,
touching the
Version of Wa-
ter into Air

THE Eye of the Understanding, is like the Eye of the Sense: For as you may see great objects through small *Cranies*, or *Levels*; so you may see great *Axioms* of *Nature*, through small and contemptible *Instances*. The *Speedy Depredation* of *Air* upon *Watry Moisture*, and *Version* of the same into *Air*, appeareth in nothing more visible than in the sudden discharge, or vanishing of a little *Cloud* of *Breath*, or *Vapour*, from *Glasses* or the *Blade* of a *Sword*, or any such polished Body; such as doth not at all detain or imbibe the moisture: For the mystiness scattereth and breaketh up suddenly. But the like *Cloud*, if it were *Oyl* or *Fatty* will not discharge; not because it sticketh faster, but because *Air*, preyeth upon *Water*, and *Flame*, and *Fire*, upon *Oyl*; and therefore, to take out a spot of Grease, they use a *Coal* upon brown Paper, because *Fire* worketh upon Grease or *Oyl*, as *Air* doth upon *Water*. And we see Paper *Oyled*, or *Wood Oyled*, or the like, last long moist; but *Wet* with *Water*, dry do putrifie sooner. The cause is, for that *Air* meddleth little with the *Moisture* of *Oyl*.

92.

Experiment
Solitary
touching the
Force of Uni-
on.

THERE is an admirable demonstration in the same trifling *Instance* of the little *Cloud* upon *Glasses*, or *Gems*, or *Blades* of *Swords* of the *Force Of Union*, even in the least quantities, and weakest Bodies, how much it conduceth to preservation of the present form, and the resisting of a new. For mark well the discharge of that *Cloud*, and you shall see it ever break up, first in the skirts, and last in the midst. We see likewise, that much *Water* draweth forth the *Juyce* of the Body infused, but little *Water* it imbibed by the Body: and this is a principal cause, why, in operation upon *Bodies*, for their *Version* or *Alteration*, the tryal in great quantities doth not answer the tryal in small, and so deceiveth many; for that (I say) the greater Body resisteth more any alteration of Form, and requireth far greater strength in the Active Body that should subdue it.

93.

Experiment
Solitary
touching the
Producing of
Feathers and
Hairs of di-
vers Colours.

WE have spoken before in the Fifth *Instance*, of the cause of *Orient Colours* in *Birds*; which is by the fineness of the Strainer, we will now endeavor to reduce the same *Axiom* to a *Work*. For this Writing of our *Sylva Sylvarum*, is (to speak properly) not *Natural History*, but a high kind of *Natural Magick*. For it is not a discription onely of *Nature* but a breaking of *Nature*, into great and strange Works. Try therefore the anointing over of *Pigeons*, or other *Birds*, when they are but in their Down, or of *Whelps*, cutting their Hair as short as may be, or of some other Beast; with some oyntment, that is not hurtful to the flesh, and that will harden and stick very close, and see whether it will not alter the colours of the *Feathers*, or *Hair*. It is received, that the pulling off the first *Feathers* of *Birds* clean, will make the new come forth *White*: And it is certain, that *White* is a penurious colour, and where moisture is scant. So *Blew Violets*, and other *Flowers*, if they be starved, turn *Pale* and *White*.

Birds

Birds, and *Horses*, by age or scars, turn *white*; and the *hoary Hairs* of *Men*, come by the same reason. And therefore in *Birds*, it is very likely, that the *Feathers* that come first, will be many times of divers colours, according to the Nature of the *Birds*; for that the skin is more porous, but when the skin is more shut and close, the *Feathers* will come *white*. This is a good *Experiment*, not onely for the producing of *Birds* and *Beasts* of strange colours, but also, for the disclosure of the nature of colours themselves; which of them require a finer porosity, and which a grosser.

IT is a work of providence that hath been truly observed by some; that the *Yolk* of the *Egg* conduceth little to the *Generation* of the *Bird*, but onely to the *nourishment* of the same: For if a *Chicken* be opened when it is new hatched, you shall find much of the *Yolk* remaining. And it is needful, that *Birds* that are shaped without the *Females Womb*, have in the *Egg*, as well matter of nourishment, as matter of generation for the *Body*. For after the *Egg* is laid, and severed from the body of the *Hen*, it hath no more nourishment from the *Hen*, but onely a quickning *Heat* when she sitteth. But *Beasts* and *Men* need not the matter of nourishment within themselves, because they are shaped within the *Womb* of the *Female*, and are nourished continually from her body.

IT is an inveterate and received opinion, That *Cantharides* applied to any part of the *Body*, touch the *Bladder*, and exulcerate it, if they stay on long. It is likewise received, that a kind of *Stone*, which they bring out of the *West-Indies*, hath a peculiar force to move *Gravel*, and to dissolve the *Stone*; infomuch, as laid but to the *Wrest*, is hath so forcibly sent down *Gravel*, as *Men* have been glad to remove it, it was so violent.

It is received and confirmed by daily experience that the *Soals* of the *Feet*, have great affinity with the *Head*, and the *Mouth* of the *Stomack*. As we see, *Going wetshod*, to those that use it not, effecteth both; Applications of *hot Powders* to the *Feet*, attenuate first, and after dry the *Rheume*. And therefore a *Physitian* that would be mystical, prescribeth for the cure of the *Rheume*, That a *Man* should work continually upon a *Camomil-Ally*; meaning, that he should put *Camomil* within his *Socks*. Likewise *Pigeons bleeding*, applied to the *Soals* of the *Feet*, ease the *Head*; and *Soporiferous Medicines* applied unto them, provoke *sleep*.

It seemeth, that as the *Feet* have a sympathy with the *Head*; so the *Wrests* and *Hands* have a sympathy with the *Heart*. We see the affects and Passions of the *Heart*, and *Spirits*, are notably disclosed by the *Pulse*: And it is often tryed, that Juices of *Stock-gilly flowers*, *Rose-campion*, *Garlick*, and other things, applied to the *Wrests*, and renewed, have cured long *Agues*. And I conceive, that washing with certain *Liquors* the *Palms* of the *Hands* doth much good: And they do well in *Heats* of *Agues* to hold in the *Hands*, *Eggs* of *Alabaster*, and *Balls* of *Crystal*.

Of these things we shall speak more, when we handle the Title of Sympathy and Antipathy, in the proper place.

THe knowledge of *Man* (hitherto) hath been detemined by the view or sight; so that what whatsoever is invisible, either in respect of the fineness of the *Body* it self, or the smallness of the *Parts*, or of the subtilty of the Motion,

94.
Experiment
Solitary
touching the
Nourishment
of Living
Creatures be-
fore they be
brought forth.

95.
Experiments
in Confort
touching
Sympathy and
Antipathy
for Medicinal
use.

96.

97.

98.
Experiment
Solitary
touching the
Secret Processes
of Nature.

Motion, is little inquired. And yet these be the things that govern Nature principally, and without which, you cannot make any true *Analysis* and *Indications* of the proceedings of Nature. The *Spirits* or *Pneumatics* that are in all *Tangible Bodies*, are scarce known: Sometimes they take them for *Vacuum*, whereas they are the most active of Bodies: Sometimes they take them for *Air*, from which they differ exceedingly, as much as Wine from Water, and as Wood from Earth: Sometimes they will have them to be *Natural Heat*, or a *Portion* of the *Element of Fire*, whereas some of them are crude and cold: And sometimes they will have them to be the *Vertues* and *Qualities* of the *Tangible Parts* which they see, whereas they are things by themselves: And then, when they come to Plants and Living Creatures, they call them *Souls*. And such superficial speculations they have; like *Prospectives* that shew things inward, when they are but paintings. Neither is this a question of words, but infinitely material in Nature: For *Spirits* are nothing else but a *Natural Body* rarified to a *Proportion*, and included in the *Tangible Parts* of *Bodies*, as in an *Integument*: And they be no less differing one from the other, then the *Dense* or *Tangible Parts*: And they are in all *Tangible Bodies*, whatsoever, more or less, and they are never (almost) at rest: And from them, and their *Motions*, principally proceed *Arefaction*, *Colliquation*, *Concoction*, *Maturation*, *Putrefaction*, *Vivification*, and most of the effects of Nature. For, as we have figured them in our *Sapientia Veterum*, in the *Fable of Proserpina*, you shall in the *Infernal Regiment* hear little doings of Pluto, but most of *Proserpina*: For *Tangible Parts* in *Bodies*, are stupid things, and the *Spirits* do (in effect) all. As for the differences of *Tangible Parts* in *Bodies* the industry of the *Chymists* hath given some light in discerning by their separations, the *Oily*, *Crude*, *Pure*, *Impure*, *Fine*, *Gross*, *Parts of Bodies*, and the like. And the *Physitians* are content to acknowledge, that *Herbs*, and *Drugs* have divers parts; as that *Opium* hath a stupefactive part, and a heating part; the one moving Sleep, the other a Sweat following; and that *Rubarb* hath Purging parts, and Astringent parts, &c. But this whole *Inquisition* is weakly and negligently handled. And for the more subtil differences of the *Minute Parts*, and the posture of them in the Body, (which also hath great effects) they are not at all touched: As for the *Motions* of the *Minute Parts of Bodies*, which do so great effects, they have not been observed at all; because they are invisible, and incur not to the eye; but yet they are to be deprehended by experience. As *Democritus* said well, when they charged him to hold, that the World was made of such little Moats, as were seen in the Sun. *Atomus* (saith he) *necessitate Rationis & Experientia esse convincitur: Atomum enim nemo unquam vidit*. And therefore the tumult in the parts of solid Bodies, when they are compressed, which is the cause of all flight of Bodies thorow the Air, and of other *Mechanical Motions*, (as hath been partly touched before, and shall be thoroughly handled in due place) is not seen at all, but nevertheless, if you know it not, or inquire it not attentively and diligently, you shall never be able to discern, and much less to produce, a number of *Mechanical Motions*. Again, as to the *Motions Corporal* within, the Enclosures of Bodies, whereby the effects (which were mentioned before) pass between the *Spirits* and the *Tangible Parts* (which are *Arefaction*, *Colliquation*, *Concoction*, *Maturation*, &c.) they are not at all handled; but they are put off by the names of *Vertues*, and *Natures*, and *Actions*, and *Passions*, and such other *Logical words*.

IT is certain, that of all *Powers* in *Nature*, *Heat* is the chief; both in the *Frame of Nature* and the in *Works of Art*. Certain it is likewise, that the effects of *Heat*, are most advanced, when it worketh upon a *Body* without loss or dissipation of the matter: for that ever betrayed the account. And therefore it is true, that the power of *Heat* is best perceived in *Distillations*, which are performed in close *Vessels* and *Receptacles*. But yet there is a higher degree; For whosoever *Distillations* do keep the *Body* in *Cells* and *Cloysters*, without going abroad, yet they give space unto *Bodies* to turn into vapor, to return into *Liquor*, and to separate one part from another. So as *Nitre* doth exspiate, although it hath not full liberty; whereby the true and ultime operations of *Heat*, are not attained: But if *Bodies* may be altered by *Heat*, and yet no such *Reciprocation* of *Rarefaction*, and of *Condensation*, and of *Separation*, admitted; then it is like that this *Protens* of *Matter*, being held by the *Sleeves*, will turn and change into many *Metamorphoses*. Take therefore a *square Vessel of iron*, in form of a *Cube*, and let it have good thick and strong sides; put it into a *Cube of Wood*, that may fill it as close as may be, and let it have a cover of *Iron* as strong (at least) as the sides, and let it be well *Luted*, after the manner of the *Chymists*; then place the *Vessel* within burning *Coals* kept quick kindled, for some few hours space; then take the *Vessel* from the *Fire*, and take off the *Cover*, and see what is become of the *Wood*, I conceive, that since all *Inflammation* and *Evaporation* are utterly prohibited, and the *Body* still turned upon it self, that one of these two effects will follow, either that the *Body* of the *Wood* will be turned into a kind of *Amalgama*, (as the *Chymists* call it,) or, that the finer part will be turned into *Air*, and the grosser stick as it were baked, and in crustate upon the sides of the *Vessel*, being become of a denser matter, than the *Wood* it self, crude. And for another tryal, take also *Water*, and put it in the like *Vessel*, stopped as before; but use a gentler *Heat*, and remove the *Vessel* sometimes from the *Fire*; and again, after some small time, when it is cold, renew the heating of it, and repeat this alteration some few times; and if you can once bring to pass, that the *Water* which is one of the simplest of *Bodies*, be changed in Colour, Odour, or Taste, after the manner of *Compound Bodies*, you may be sure that there is a great work wrought in *Nature*, and a notable entrance made into strange changes of *Bodies*, and productions; and also a way made to do that by *Fire*, in small time, which the *Sun* and *Age* do in long time. But of the admirable effects of this *Distillation in close*, (for so we will call it) which is like the *Wombs* and *Matrices* of *Living Creatures*, where nothing expireth nor separateth: We will speak fully, in the due place. Not that we aim at the making of *Peracelsus Pigmyes*, or any such prodigious follies; but that we know the effects of *Heat* will be such, will scarce fall under the conceit of *Man*, if the force of it be altogether kept in.

THere is nothing more certain in *Nitre*, than that it is impossible for any *Body* to be utterly annihilated; but that as it was the work of the *Omnipotency* of *God*, to make *Somewhat* of *Nothing*: So it requireth the like omnipotency, to turn *Somewhat* into *Nothing*. And therefore it is well said by an obscure *Writer* of the *Seet* of the *Chymists*, That there is no such way to effect the strange *Transmutations* of *Bodies*, as to endeavour and urge by all means, the *Reducing* of them to *Nothing*. And herein is contained al-

99.
Experiment
Solitary
touching the
Power of Heat.

98.
Experiment
Solitary
touching the
Impossibility
of Annihila-
tion.

so a great secret of Preservation of Bodies from change; for if you can prohibit, that they neither turn into *Air*, because no *Air* cometh to them, nor go into the *Bodies Adjacent*, because they are utterly Heterogeneal, nor make a *round* and *Circulation* within themselves; they will never change, though they be in their Nature never so perishable or mutable, We see how *Flies* and *Spiders*, and the like, get a *Sepulchre* in *Amber*, more durable than the *Monument* and *Embalming* of the *Body* of any *King*. And I conceive the like will be of Bodies put into *Quick-silver* But then they must be but thin, as a leaf or a piece of paper or parchment; for if they have a greater crassitude, they will alter in their own Body, though they spend not. But of this, we shall speak more when we handle the *Title* of *Conservation* of *Bodies*.





NATURAL HISTORY.

Century II.



Music in the *Practice* hath been well pursued, and in good Variety; but in the *Theory*, and especially in the *Yielding* of the *Causes* of the *Practick*, very weakly; being reduced into certain Mystical subtilties, of no use and not much truth. We shall therefore, after our manner, joyn the *Contemplative* and *Active Part* together.

Experiments
in Consort
touching
Musick.

All Sounds, are either *Musical Sounds*, which we call *Tones*; whereunto there may be an *Harmony*, which Sounds are ever equal: As *Singing*, the Sounds of *Stringed*, and *Wind-Instruments*, the *Ring*ing of *Bells*, &c. Or *Immusical Sounds*, which are ever *unequal*; Such as are the *Voice* in *Speaking*, all *Whisperings*, all *Voices* of *Beasts* and *Birds* (except they be *Singing* *Birds*; all *Percussions*, of *Stones*, *Wood*, *Parchment*, *Skins*, (as in *Drums*) and infinite others.

101.

The Sounds that produce *Tones*, are ever from such *Bodies* as are in their Parts and Pores equal; as well as the Sounds themselves are equal: And such are the *Percussions* of *Metal*, as in *Bells*: Of *Glass*, as in the filliping of a *Drinking Glass*: Of *Air*, as in *Mens Voices* whilest they sing, in *Pipes*, *Whistles*, *Organs*, *Stringed Instruments*, &c. And of *Water*, as in the *Nightingal-Pipes* of *Regals*, or *Organs*, and other *Hydraulicks*, which the *Ancients* had, and *Nero* did so much esteem, but are now lost. And if any Man think, that the *String* of the *Bow*, and the *String* of the *Viol*, are neither of them equal *Bodies*, and yet produce *Tones*, he is in an error. For the Sound is not created between the *Bow* or *Plectrum*, and the *String*; but between the *String* and the *Air*; no more than it is between the *Finger* or *Quill*, and the *String* in other *Instruments*. So there are (in effect) but three *Percussions* that

102.

create *Tones*; *Percussions* of *Metals* (comprehending *Glass*, and the like) *Percussions* of *Air*, and *Percussions* of *Water*.

103.

The *Diapason* or *Eight* in *Musick*, is the sweetest *Concord*; insomuch, as it is in effect an *Unison*, as we see in *Lutes* that are strung in the base strings with two strings, one an *Eight* above another, which make but as one sound; and every *Eighth* Note in Ascent, (as from *Eight* to *Fifteen*, from *Fifteen* to *Twenty two*, and so in *infinitum*) are but *Scales* of *Diapason*. The cause is dark, and hath not been rendred by any, and therefore would be better contemplated. It seemeth that *Air* (which is the subject of *Sounds*) in *Sounds* that are not *Tones* (which are all *unequal* as hath been said) admitteth much variety; as we see in the *Voices* of *Living Creatures*, and likewise in the *Voices* of several *Men*; (for we are capable to discern several *Men* by their *Voices*) and in the *Conjugation* of *Letters*, whence *Articulate Sounds* proceed; which of all others, are most various. But in the *Sounds* which we call *Tones* (that are ever *equal*) the *Air* is not able to cast it self into any such variety; but is forced to recur into one and the same *Posture* or *Figure*, onely differing in greatness and smallness. So we see *Figures* may be made of *Lines*, crooked and straight, in infinite variety, where there is inequality; but *Circles* or *Squares*, or *Triangles Equilateral*, (which are all *Figures* of equal *Lines*) can differ but in greater or lesser.

104.

It is to be noted (the rather, lest any *Man* should think that there is any thing in this *number* of *Eight*, to create the *Diapason*) that this computation of *Eight*, is a thing rather received than any true computation. For a true computation ought ever to be, by distribution into equal *Portions*. Now there be intervenient in the rise of *Eight* (in *Tones*) two *Beemols* or *Half Notes*; so as if you divide the *Tones* equally, the *Eight* is but *Seven* whole and equal *Notes*: And if you subdivide that into *Half-Notes*, (as it is in the stops of a *Lute*) it maketh the *number* of *Thirteen*.

105.

Yet this is true, That in the ordinary *Rises* and *Falls* of the *Voice* of *Man* (not measuring the *Tone* by whole *Notes* and *Half-Notes*, which is the equal Measure) there fall out to be two *Beemols* (as hath been said) between the *Unison* and the *Diapason*; and this varying is natural. For if a *Man* would endeavour to raise or fall his *Voice* still by *Half-Notes*, like the stops of a *Lute*, or by whole *Notes* alone, without *Halfs* as far as an *Eight*; he will not be able to frame his *Voice* unto it, which sheweth that after every three whole *Notes*, Nature requireth, for all *Harmonical* use, one *Half-Note* to be interposed.

106.

It is to be considered, That whatsoever vertue is in *Numbers* for conducting to concert of *Notes*, is rather to be ascribed to the *Ante-number*, than to the *Entire number*; as namely, that the *Sound* returneth after *Six*, or after *Twelve*: So that the *seventh* or the *Thirteenth* is not the Matter, but the *Sixth*, or the *Twelfth*; and the *seventh* and the *Thirteenth* are but the *Limits* and *Boundaries* of the *Return*.

107.

The *Concords* in *Musick* which are *Perfect* or *Semiperfect*, between the *Unison* and the *Diapason*, are the *Fifth*, which is the most perfect; the *Third* next, and the *Sixth* which is more harsh: And the *Ancients* esteemed, and so do my self, and some other yet, the *Fourth* which they call *Diatefferon*; as for the *Tenth*, *Twelfth*, *Thirteenth*, and so in *infinitum* they be but *Recurrences* of the former; viz. of the *Third*, the *Fifth*, and the *Sixth* and the *Eight* respectively from them.

For

For *Discords*, the *Second* and the *Seventh*, are of all others the most odious in *Harmony* to the *sense*, whereof, the one is next above the *Unison*, the other next under the *Diapason*; which may shew, that *Harmony* requirerh a competent distance of *Notes*.

108.

In *Harmony*, if there be not a *Discord* to the *Base*, it doth not disturb the *Harmony*, though there be a *Discord* to the *biger parts*; so the *Discord* be not of the two that are odious: And therefore the ordinary *Concent* of *Four parts* consisteth of an *Eight*, a *Fifth*, and a *Third* to the *base*; but that *Fifth* is a *Fourth* to the *Treble*, and the *Third* is a *Sixth*. And the *Cause* is, for that the *Base* striking more *Air*, doth overcome and drown the *Treble* (unless the *Discord* be very odious) and so hideth a small imperfection. For we see, that in one of the *lower strings* of a *Lute*, there soundeth not the sound of the *Treble*, nor any *mixt sound*, but only the sound of the *Base*.

109.

We have no *Musick* of *Quarter-Notes*, and it may be, they are not capable of *Harmony*; for we see the *Half-Notes* themselves do but interpose sometimes. Nevertheless, we have some *Slides* or *Relishes* of the *Voice* or *Strings*, as it were, continued without *Notes*, from one *Tone* to another, rising or falling, which are delightful

110.

The causes of that which is *Pleasing* or *ingrate* to the *Hearing*, may receive light by that which is *Pleasing* or *ingrate* to the *Sight*. There be two things pleasing to the sight (leaving *Pictures* and *shapes* aside, which are but *Secondary Objects*, and please or displease but in *Memory*;) these Two are *Colours* and *Order*. The pleasing of *Colour* symbolizeth with the *Pleasing* of any *Single Tone* to the *Ear*; but the pleasing of *Order* doth symbolize with *Harmony*. And therefore we see in *Garden-knots*, and the *Frets of Houses*, and all equal and well answering *Figures*, (as *Globes*, *Pyramids*, *Cones*, *Cylinders*, &c.) how they please; whereas *unequal Figures* are but *Deformities*. And both these *pleasures*, that of the *Eye*, and that of the *Ear*, are but the effects of *equality*, good *proportion*, or *correspondence*: So that (out of question) *Equality* and *Correspondence* are the causes of *Harmony*. But to find the *Proportions* of that *Correspondence*, is more abstruse; whereof, notwithstanding we shall speak somewhat (when we handle *Tones*, in the general enquiry of *Sounds*).

111.

Tones are not so apt altogether to procure *Sleep*, as some other *Sounds*: As the *Wind*, the *Purling of Water*, *Humming of Bees*, a *sweet Voice* of one that readeth, &c. The cause whereof is, for that *Tones*, because they are equal and slide not, do more strike and erect the *Sense*, than the other. And overmuch attention hindereth *sleep*.

112.

There be in *Musick*, certain *Figures* or *Tropes*, almost agreeing with the *Figures* or *Rhetorick*, and with the *Affections* of the *Mind*, and other *Senses*. First, The *Division* and *Quavering* which please so much in *Musick*, have an agreement with the *Glittering of Light*; As the *Moon-Beams* playing upon a *Wave*. Again, the *Falling* from a *Discord* to a *Concord*, which maketh great sweetness in *Musick* hath an agreement with the *Affections*, which are reintegrated to the better, after some dislike; it agreeth also with the *taste*, which is soon glutted with that which is sweet alone. The *sliding from the Close* or *Cadence*, hath an agreement with the *Figure* in *Rhetorick*, which they call *Præter Expectatum*; for there is a pleasure, even in being deceived. The *Re-ports* and *Fuges* have an agreement with the *Figures* in *Rhetorick* of *Repetition* and *Traduction*. The *Tripla's* and *Changing of Times*, have an agreement with the

113.

114.

the *changes of Motions*; as when *Galliard time*, and *Measure time*, are in the *Medly* of one *Dance*.

It hath been anciently held, and observed, That the *Sense of Hearing*, and the *Kinds of Musick* have most operation upon *Manners*; as to encourage Men and make them warlike; to make them soft and effeminate, to make them grave, to make them light, to make them gentle and inclined to pity, &c. The *cause* is for that the *Sense of Hearing* striketh the *Spirits* more immediately, than the other *Senses*, and more incorporeally than the *Smelling*: For the *Sight*, *Taste*, and *Feeling*, have their *Organs*, not of so present and immediate access to the *Spirits*, as the *Hearing* hath. And as for the *Smelling* (which indeed worketh also immediately upon the *Spirits*, and is forcible while the object remaineth) it is with a communication of the *Breath* or *Vapor* of the object *oderate*: But *Harmony* entring easily, and mingling not at all, and coming with a manifest motion, doth by custom of often affecting the *Spirits*, and putting them into one kind of posture, alter not a little the nature of the *Spirits*, even when the object is removed. And therefore we see, that *Tunes* and *Airs*, even in their own nature, have in themselves some affinity with the *Affections*: As there be *Merry Tunes*, *Doleful Tunes*, *Solemn Tunes*, *Tunes inclining Mens mindes to Pity*, *Warlike Tunes*, &c. So as it is no marvel, if they alter the *Spirits* considering that *Tunes* have a *Perdisposition* to the *Motion* of the *Spirits* in themselves. But yet it hath been noted, that though this variety of *Tunes*, doth dispose the *Spirits* to variety of *Passions*, conform unto them; yet generally, *Musick* feedeth that disposition of the *Spirits* which it findeth. We see also, that several *Airs* and *Tunes*, do please several *Nations* and *Persons*, according to the sympathy they have with their *Spirits*.

Experiments
in Consort
touching
Sounds; and
first touching
the Nullity,
and Entry of
Sounds.

115.

Perspective hath been with some diligence inquired; and so hath the *Nature of Sounds*, in some sort, as far as concerneth *Musick*, but the *Nature of Sounds* in general, hath been superficially observed. It is one of the subtillest pieces of Nature. And besides, I practise, as I do advice: Which is after long inquiry of things, immerse in matter, to enterpose some subject which is immateriate or less materiate; such as this of *Sounds*: To the end, that the *intellect* may be rectified, and become not partial.

It is first to be considered, what *great motions* there are in Nature which pass without *sound* or *noise*. The *Heavens* turn about in a most rapide motion, without *noise* to us perceived, though in some *dreams* they have been said to make an excellent *Musick*. So the *Motions* of the *Comets*, and *Fiery Meteors* (as *Sella Cadens*, &c.) yield no *noise*. And if it be thought, that it is the greatness of distance from us, whereby the *sound* cannot be heard; we see that *Lightnings* and *Corruscations*, which are near at hand, yield no *sound* neither; and yet in all these, there is a pereussion and division of the *Air*. The *Winds* in the *Upper Region* (which move the *Clouds* above (which we call the *Rack*) and are not perceived below) pass without *noise*. The *lower Winds* in a *Plain*, except they be strong, make no *noise*; but amongst *Trees*, the *noise* of such *Winds* will be perceived. And the *Winds* (generally) when they make a *noise*, do ever make it unequally, rising and falling, and sometimes (when they are vehement) trembling at the height of their blast. *Rain* or *Hail* falling, (though vehemently,) yieldeth no *noise*, in passing through the *Air*, till it fall upon the *Ground*, *Water*, *Houses*, or the like. *Water* in a *River* (though a swift stream,) is not heard in the *Channel*, but

but runneth in silence, if it be of any depth; but the very *Stream* upon *Shallows*, of Gravel, or Pebble, will be heard. And *Waters*, when they beat upon the Shore, or are strained, (as in the falls of Bridges) or are dashed against themselves by *Winds*, give a roaring noise. Any *peice of Timber*, or *hard Body*, being thrust forwards by another Body contiguous, without knocking giveth no noise. And so *Bodies* in weighing, one upon another, though the *upper Body* press the *lower Body* down, make no noise. So the *motion* in the *Minute parts* of any *Solid Body*, (which is the principal cause of *violent Motion*, though unobserved, passeth without sound: For that sound, that is heard sometimes, is produced onely by the breaking of the *Air*, and not by the impulsion of the parts. So it is manifest, that where the anterior Body giveth way as fast as the posterior cometh on, it maketh no noise, be the *motion* never so great or swift,

Air open, and at large, maketh no noise, except it be sharply percussed; as in the sound of a string, where *Air* is percussed by a hard and stiffe Body, and with a sharp loose: For if the string be not strained, it maketh no noise; but where the *Air* is pent and straitned, there breath, or other blowing (which carry but a gentle percussion) suffice to create sound; as in *Pipes* and *Wind-Instruments*. But then you must note, that in *Recorders*, which go with a gentle breath, the *Concave* of the *Pipe*, were it not for the *Fipple* that straitneth the *Air* (much more then the *simple Concave*) would yield no sound. For, as for other *Wind Instruments*, they require a forcible breath, as *Trumpets*, *Cornets*, *Hunters-Horns*, &c. Which appeareth by the blown Cheeks of him that windeth them. *Organs* also are blown with a strong wind by the Bellows. And note again, that some kind of *Wind-Instruments*, are blown at a small hole in the side, which straitneth the breath at the first entrance; the rather, in respect of their *traverse*, and *stop* above the hole which performeth the *Fipples* part; as it is seen in *Flutes* and *Fifes*, which will not give sound, by a blast at the end, as *Recorders* &c. do. Likewise in all *Whistling* you contract the mouth; and to make it more sharp, Men sometimes use their finger.

But in *open Air*, if you throw a Stone or a Dart, they give no sound: No more do *Bullets*, except they happen to be a little hallowed in the casting; which hollownes penneth the *Air*: Nor yet *Arrows*, except they be ruffled in their Feathers, which likewise penneth the *Air*. As for *small Whistles* or *Shepherds Oaten-Pipes*, they give a sound, because of their extream slenderness, whereby the *Air* is more pent than in a wider *Pipe*. Again, the *Voices* of *Men* and *Living Creatures*, pass through the Throat, which penneth the breath. As for the *Jews-Harp*, it is a sharp percussion, and besides hath the vantage of penning the *Air* in the Mouth.

116.

Solid Bodies, if they be very softly percussed, give no sound; as when a Man treadeth very softly upon Boards. So *Chests*, or *Doors*, in fair weather when they open easily, give no sound. And *Cart-wheels* squeek not when they are liquored.

117.

The *Flame* of *Tapers* or *Candles*, though it be a swift motion and breaketh the *Air*, yet passeth without sound. *Air* in *Ovens*, though (no doubt) it doth (as it were) boil, and dilate it self, and is repercussed, yet it is without noise.

118.

Flame percussed by *Air*, giveth a noise; As in blowing of the *Fire* by Bellows, greater than if the Bellows should blow upon the *Air* it self. And so likewise *Flame* percussing the *Air* strongly (as when *Flame* suddenly taketh and openeth) giveth a noise: So great *Flames*, whiles the one impelleth the other, give a bellowing sound.

There

120.

There is a conceit runneth abroad, that there should be a *White Powder* which will discharge a piece without *noise*, which is a dangerous experiment, if it should be true: For it may cause secret Murthers, but it seemeth to me impossible; for if the *Air pent*, be driven forth and strike the *Air open*, it will certainly make a *noise*. As for the *White Powder*, (if any such thing be that may extinguish or dead the *noise*) it is like to be a mixture of *Petre* and *Sulphur*; without *Coal*. For *Petre* alone will not take *Fire*. And if any Man think, that the sound may be extinguished or deaded, by discharging the *pent Air*, before it cometh to the *Mouth* of the *Piece*, and to the *open Air*, that is not probable; for it will make more divided sounds. As if you should make a Cross-barrel hollow, thorow the Barrel of a *Piece*, it may be it would give several sounds, both at the Nose and the sides. But I conceive, that if it were possible to bring to pass, that there should be no *Air pent* at the Mouth of the *Piece*, the *Bullet* might fly with small or no *noise*. For first it is certain, there is no *noise* in the *Percussion* of the *Flame* upon the *Bullet*. Next the *Bullet*, in piercing thorow the *Air*, maketh no *noise*, as hath been said; and then, if there be no *pent Air*, that striketh upon *open Air*, there is no cause of *noise*, and yet the flying of the *Bullet* will not be staid. For that *Motion* (as hath been oft said) is in the parts of the *Bullet*, and not in the *Air*. So as tryal must be made by taking some small *Concave* of *Metal*, no more than you mean to fill with *Powder*, and laying the *Bullet* in the Mouth of it half out into the *open Air*.

121.

I heard it affirmed by a Man that was a great dealer in Secrets, but he was but vain; That there was a *Conspiracy* (which himself hindred) to have killed *Queen Mary*, Sister to *Queen Elizabeth*, by a *Burning-Glass*, when she walked in *St. James Park*, from the Leads of the House. But thus much, no doubt, is true; That if *Burning-Glasses*, could be brought to a great strength (as they talk generally of *Burning-Glasses*, that are able to burn a *Navy*) the *Percussion* of the *Air* alone, by such a *Burning-Glass* would make no *noise*; no more than is found in *Corruscations* and *Lightnings* without *Thunders*.

122.

I suppose that *Impression* of the *Air* with *Sounds*, asketh a time to be conveyed to the *Sense*, as well as the *Impression* of *Species visible*, or else they will not be heard. And therefore, as the *Bullet* moveth so swift, that it is *invisible*, so the same *swiftness* of *motion* maketh it *inaudible*; for we see that the apprehension of the *Eye*, is quicker then that of the *Ear*.

123.

All *Eruptions* of *Air*, though small and flight, give an *entity* of *sound*, which we call *Crackling*, *Puffing*, *Spitting*, &c. As in *Bay-salt*, and *Bay-leaves*, cast into the *Fire*; so in *Chusnuts*, when they leap forth of the *Ashes*, so in *Green Wood* laid upon the fire, especially *Roots*; so in *Candles* that spit flame, if they be wet; so in *Rasping*, *Sneezing*, &c. So in a *Rose leaf* gathered together into the fashion of a *Purse*, and broken upon the *Fore-head*, or *Back* of the *Hand*, as *Children* use.

124.
Experiments
in Confort
touching
Production,
Conservation,
and Dialation
of Sounds; and
the office of the
Air therein.

The cause given of *Sound*, that it should be an *Elision* of the *Air* (whereby, if they mean any thing, they mean a *Cutting* or *Dividing*, or else an *Attenuating* of the *Air*) is but a term of Ignorance; and the motion is but a catch of the *Wit* upon a few Instances; as the manner is in the *Phylosophy* received. And it is common with Men, that if they have gotten a pretty expression by a word of *Art*, that expression goeth currant, though it be empty of matter. This conceit of *Elision* appeareth most manifestly

to be false, in that the *Sound* of a *Bell* String, or the like, continueth melting sometimes after the *Percussion*; but ceaseth straight ways, if the *Bell* or *String* be touched and stayed; whereas, if it were the *Elision* of the *Air*, that made the *Sound*, it could not be that the touch of the *Bell* or *String* should extinguish so suddenly that motion, caused by the *Elision* of the *Air*. This appeareth yet more manifestly, by *Chiming* with a *Hammer* upon the outside of a *Bell*; for the *Sound* will be according to the inward Concave of the *Bell*. Whereas the *Elision*, or *Attenuation* of the *Air*, cannot be, but onely between the *Hammer*, and the outside of the *Bell*. So again, if it were an *Elision*, a broad *Hammer*, and a *Bodkin* struck upon Metal, would give a divers *Tone*, as well as a divers *Loudness*: But they do not so; for though the *Sound* of the one be louder, and of the other softer, yet the *Tone* is the same. Besides, in *Eccho's* (whereof some are as loud as the *Original Voice*) there is new *Elysson*, but a *Repercussion* onely. But that, which convinceth it most of all, is; That *Sounds* are generated, where there is no *Air* at all. But these, and the like conceits, when Men have cleared their Understanding, by the light of Experience, will scatter and break up like a *Mist*.

It is certain, that *Sounds* is not produced at the first, but with some *Local Motion* of the *Air* or *Flame*, or some other *Medium*; nor yet without some *resistance*, either in the *Air* or the *Body percussed*. For if there be a meer yielding or cession, it produceth no *Sound*, as hath been said. And therein *Sounds* differ from *Light* and *Colours* which pass through the *Air*, or other *bodies* without any *Local Motion* of the *Air* either at the first or after. But you must attentively distinguish between the *Local Motion* of the *Air* (which is but *Vehiculum causæ*, a *Carrier of the Sounds*), and the *Sounds* themselves conveyed in the *Air*. For as to the former, we see manifestly that no *Sound* is produced (no not by *Air* it self against other *Air*, as in *Organs*, &c.) but with a perceptible *Blast* of the *Air* and with some *resistance* of the *Air* stricken. For, even all *Speech*, (which is one of the gentlest *Motions* of *Air*), is with *expulsion* of a little *Breath*. And all *Pipes* have a *Blast* as well as a *Sound*. We see also manifestly, that *Sounds* are carried with *Wind*: And therefore *Sounds* will be heard further with the *Wind*, than against the *Wind*; and likewise, do rise and fall with the intension or remission of the *Wind*: But for the *Impression* of the *Sound*, it is quite another thing, and is utterly without any *Local Motion* of the *Air* perceptible; and in that resembleth the *species visible*: For after a *Man* hath lured, or a *Bell* is rung, we cannot discern any *Perceptible Motion* (at all) in the *Air* as long as the *Sound* goeth, but onely at the first. Neither doth the *Wind*, (as far as it carrieth a *Voice*) with the *Motion* thereof, confound any of the delicate, and Articulate Figurations of the *Air*, in variety of Words. And if a *Man* speak a good loudness against the *Flame* of *Candle*, it will not make it tremble much; though most, when those *Letters* are pronounced which contract the mouth, as *F, S, V*, and some others. But *Gentle breathing*, or *blowing* without *Speaking* will move the *Candle* far more. And it is the more probable, that *Sound* is without any *Local Motion* of the *Air*, because as it differeth from the *sight* in that it needeth a *Local Motion* of the *Air* at first: So it paralleleth in so many other things with the *sight*, and *Radiation* of things visible, which (without all question) induce no *Local Motion* in the *Air*, as hath been said.

Mevertheless it is true, that upon the *Noise* of *Thunder*, and great *Ordinance*, *Glass Windows* will shake, and *Fishes* are thought to be frayed with the

125.

126.

the Motion, caused by *Noise* upon the Water. But these effects are from the local motion of the *Air*, which is a concomitant of the *Sound* (as hath been said) and not from the *Sound*.

127.

It hath been anciently reported, and is still received, that *extream applauses*, and *shouting of people*, assembled in great multitudes, have so rarified, and broken the *Air*, that *Birds* flying over, have fallen down, the *Air* being not able to support them. And it is believed by some, that *Great Ringing of Bells* in populous Cities, hath chased away *Thunder*; and also dissipated pestilent *Air*: All which may be also from the concussion of the *Air*, and not from the *Sound*.

128.

A very great *Sound* near hand hath stricken many *deaf*; and at the instant they have found, as it were, the breaking of a Skin or Parchment in their *Ear*: And my self, standing near one that *Lured* loud and shrill, had suddenly an offence, as if some what had broken, or been dislocated in my *Ear*, and immediately after a *loud Ringing*; (not an ordinary Singing, or Hisling, but far louder, and differing;) so as I feared some *Deafness*. But after some half quarter of an hour, it vanished. This effect may be truly referred unto the *Sound*; for (as is commonly received) an *over Potent Object* doth destroy the *sense*, and *Spiritual Species* (both *visible* and *audible*;) will work upon the sensories, though they move not any other Body.

129.

In *Delation of Sounds*, the *Enclosure* of them preserveth them, and causeth them to be heard further. And we find in Rows of Parchment or Trunks, the Mouth being laid to the one end of the Row of Parchment, or Trunk, and the *Ear* to the other, the *Sound* is heard much further then in the *Open Air*. The cause is, for that the *Sound* spendeth and is dissipated in the *Open Air*; but in such Concaves, it is conserved and contracted, So also in a Piece of Ordnance, if you speak in the Touch-hole, and another lay his *Ear* to the Mouth of the Piece, the *Sound* passeth, and is far better heard than in the *Open Air*.

130.

It is further to be considered, how it proveth and worketh when the *Sound* is not *Enclosed*, all the length of his way, but passeth partly through open Air; as where you speak some distance from a *Trunk*, or where the *Ear* is some distance from the *Trunk*, at the other end: or where both *Mouth* and *Ear* are distant from the *Trunk*. And it is tryed that in a long *Trunk* of some Eight or ten foot, the *sound* is holpen, though both the *Mouth*, and the *Ear* be a handful or more from the ends of the *Trunk*; and somewhat more holpen, when the *Ear* of the *Hearer* is near, than when the *Mouth* of the *Speaker*. And it is certain, that the *Voice* is better heard in a *Chamber* from abroad, than abroad from within the *Chamber*.

131.

As the *Enclosure* that is round about and entire preserveth the *Sound*; so doth a *Semiconcave*, though in a less degree. And therefore, if you divid a *Trunk* or a *Cane* into two, and one speak at the one end, and you lay your *Ear* at the other, it will carry the *Voice* further, than in the *Air* at large. Nay further if it be not a full *Semi-concave*; but if you do the like upon the *Mast* of a *Ship*, or a long *Pole*, or a *Piece of Ordnance* (though one speak upon Surface of the *Ordnance*, and not at any of the Bores) the *Voice* will be heard further then in the *Air* at large.

132.

It would be tryed, how, and with what proportion of disadvantage the *Voice* will be carried in an *Horn*, which is a *Line Arched*; or in a *Trumpet*, which is a *Line Retorted*: or in some *Pipe* that were *Sinuou*.

It

It is certain, (howsoever it cross the received opinion) that *sounds* may be created without *Air*, though *Air* be the most favourable different of *sounds*. Take a *Vessel* of *Water*, and knap a pair of *Tongs* some depth within the *Water*, and you shall hear the *sound* of the *Tongs* well, and not much diminished, and yet there is no *Air* at all present.

133.

Take one *Vessel* of *Silver*, and another of *Wood*, and fill each of them full of *water*, and then knap the *Tongs* together as before, about an handfull from the bottom, and you shall find the *sound* much more resounding from the *Vessel* of *Silver*, than from that of *Wood*; and yet if there be no *Water* in the *Vessel*, so that you knap the *Tongs* in the *Air*, you shall finde no difference between the *silver*, and *Wooden Vessel*, whereby beside the main point of creating *sound* without *Air*, you may collect two things; the one, that the *sound* communicateth with the bottom of the *Vessel*; the other, that such a communication passeth far better thorow *Water* than *Air*.

134.

Strike any *hard Bodies* together in the midst of a *flame*, and you shall hear the *sound* with little difference, from the *sound* in the *Air*.

135.

The *Pneumatical Part*, which is in all *Tangible Bodies*, and hath some affinity with the *Air*, performed in some degree, the parts of the *Air*; as when you knock, upon an *empty Barrel*, the *sound* is (in part) created by the *Air* on the outside, and (in part) by the *Air* in the inside; for the *sound* will be greater or lesser, as the *Barrel* is more empty, or more full; but yet the *sound* participateth also with the *Spirit* in the *Wood*, thorow which it passeth from the outside to the inside; and so it cometh to pass in the chiming of *Bells* on the outside, where also the *sound* passeth to the inside; and a number of other like instances, whereof we shall speak more when we handle the *Communication of Sounds*.

136.

It were extream, grossness to think (as we have partly touched before) that the *sound* in *Strings* is made, or produced between the *Hand* and the *String*, or the *Quill* and the *String*, or the *Bow* and the *String*: For those are but, *Vehicula motus*, passages to the *Creation* of the *sound*, the *sound* being produced between the *String* and the *Air*; and that not by any *impulsion* of the *Air*, from the first *Motion* of the *String*; but by the *return* or *result* of the *String*, which was strained by the touch to his former place; which *Motion of Result* is quick and sharp, whereas the first *Motion* is soft and dull. So the *Bow* tortureth the *String* continually, and thereby holdeth it in a continual *Trepidation*.

137.

Take a *Trunk*, and let one whistle at the one end, and hold you rear at the other, and you shall find the *sound* strike so sharp, as you can scarce endure it. The *cause* is, for that *sound* diffuseth it self in round, and so spendeth it self: But if the *sound* which would scatter in *open Air* be made to go all into a *Canale*, it must needs give greater force to the *sound*. And so you may note, that *inclosures* do not onely preserve *sound*, but also encrease and sharpen it.

138.

Experiments in Consort, touching the Magnitude and Ellity, and Damps of Sounds.

A *Hunters Horn*, being greater at one end, than at the other, doth encrease the *sound* more, than if the *Horn* were all of an equal bore. The *cause* is, for that the *Air* and *sound*, being first contracted at the lesser end, and afterwards having more room to spread at the greater end, do dilate themselves, and in coming out, strike more *Air*, whereby the *sound* is the greater, and baser. And even *Hunters Horns*, which are sometimes

139.

made straight, and not oblick, are ever greater at the lower end. It would be tryed also in *Pipes*, being made *far larger* at the lower end, or being made with a *Belly* towards the lower end, and then issuing into a straight concave again.

140. There is in *St. Jameses Fields*, a *Conduit* of *Brick*, unto which joyneth a *low Vault*; and at the end of that, a *round House* of *Stone*; and in the *Brick Conduit* there is a *Window*, and in the *round House* a *Slit* or *Rift* of some little breadth; if you cry out in the *Rift*, it will make a fearful roaring at the *Window*. The *Cause* is the same with the former: For that all *Concaves* that proceed from more narrow to more broad, do amplify the *Sound* at the coming out.

141. *Hawks Bells* that have holes in the sides, give a greater ring, than if the *Pellet* did strike upon *Brass* in the open *Air*. The cause is the same with the first instance of the *Trunk*: Namely, for that the *Sound*, enclosed with the sides of the *Bell*, cometh forth at the holes unspent and more strong.

142. In *Drums*, the closeness round about, that preserveth the *Sound* from dispersing, maketh the *Noise* come forth at the *Drum-hole*, far more loud and strong, than if you should strike upon the like *Skin*, extended in the open *Air*. The *Cause* is the same with the two precedent.

143. *Sounds* are better heard, and further off, in an *Evening*, or in the *Night*, than at the *Noon*, or in the *Day*. The cause is, for that in the *Day*, when the *Air* is more thin (no doubt) the *Sound* pierceth better; but when the *Air* is more thick (as in the *Night*) the *Sound* spendeth and spreadeth abroad less; and so it is a degree of *Enclosure*. As for the night, it is true also, that the general silence helpeth.

144. There be two kindes of *Reflections* of *Sounds*; the one at *Distance*, which is the *Eccho*, wherein the *original* is heard distinctly, and the *Reflexion* also distinctly; of which, we shall speak hereafter. The other in *Concurrence*; when the *sound* reflecting (the *Reflexion* being near at hand) returneth immediately upon the *original*, and so iterateth it not, but amplifieth it. Therefore we see, that *Musick* upon the *Water* soundeth more; and so likewise, *Musick* is better in *Chambers* *Wainscotted* than *Hanged*.

145. The *Strings* of a *Lute*, or *Viol*, or *Virginals*, do give a far greater *Sound*, by reason of the *Knot*, and *Board*, and *Concave* underneath, than if there were nothing but onely the *Flat* of a *Board*, without that *Hollow* and *Knot*, to let in the upper *Air* into the lower. The cause is, the communication of the upper *Air* with the lower, and penning of both from expence or dispersing.

146. An *Irish Harp* hath open *Air* on both sides of the *Strings*; and it hath the *Concave* or *Belly*, not a long the *Strings*, but at the end of the *Strings*. It maketh a more resounding *Sound*, than a *Bandora*, *Orpharion*, or *Cittern*, which have likewise *Wire-Strings*. I judge the *Cause* to be, for that open *Air* on both sides helpeth, so that there be a *Concave*; which is therefore best placed at the end.

147. In a *Virginal*, when the *Lid* is down it maketh a more exile *Sound* than when the *Lid* is open. The cause is, for that all shutting in of *Air*, where there is no competent *Vent*, dampeth the *Sound*; which maintaineth likewise the former *Instance*; For the *Belly* of the *Lute*, or *Viol*, doth pen the *Air* somewhat.

There

There is a *Church* at *Glocester*, (and as I have heard, the like is in some other places) where if you speak against the Wall softly, another shall hear your *Voice* better a good way off, than near hand. Inquire more particularly of the frame of that place. I suppose there is some Vault, or Hollow, or Ile, behind the Wall, and some passage to it, towards the further end of that Wall against which you speak : So as the *Voice* of him that speaketh slideth along the Wall, and then entreth at some passage, and communicateth with the *Air* of the Hollow ; for it is preserved somewhat by the plain Wall, but that is too weak to give a *Sound* audible, till it hath communicated with the back *Air*.

148.

Strike upon a *Bow-string* and lay the *Horn* of the *Bow* near your Ear, and it will increase the *Sound*, and make a degree of a *Tone*. The cause is for that the sensory, by reason of the close holding, is percussed, before the *Air* disperseth. The like is, if you hold the *Horn* betwixt your Teeth, But that is a plain *Dilation* of the *Sound*, from the Teeth to the Instrument of hearing ; for there is a great intercourse between those two parts, as appeareth by this, that a harsh *grating Tune* setteth the Teeth one edge. The like falleth out, if the *Horn* of the *Bow* be put upon the Temples ; but that is but the slide of the *Sound* from thence to the ear.

149.

If you take a *Rod* of *Iron* or *Brass*, and hold the one end to your ear and strike upon the other, it maketh a far greater *Sound*, than the like stroke upon the *Rod*, not so made contiguous to the Ear. By which, and by some other instances that have been partly touched, it should appear, that *Sounds* do not onely slide, upon the surface of a smooth Body, but do also communicate with the Spirits that are in the Pores of the Body.

150.

I remember in *Trinity-Colledge* in *Cambridge*, there was an upper *Chamber*, which being thought weak in the Roof of it, was supported by a Pillar of *Iron*, of the bigness of ones arm, in the midst of the *Chamber*, which, if you had struck, it would make a little flat noise in the *Room* where it was struck ; but it would make a great bomb in the *Chamber* beneath.

151.

The *sound* which is made by *Buckets* in a *Well*. when they touch upon the *Water*, or when they strike upon the side of the *Well*, or when two *Buckets* dash the one against the other. These *Sounds* are deeper and fuller than if the like Percussion were made in the open *Air*. The cause is the penning and enclosure of the *Air* in the concave of the *Well*.

152.

Barrels placed in a *Room* under the Floor of a *Chamber*, make all noises in the same Chamber more full and resounding.

153.

So that there be five ways (in general) of Majoration of Sounds, Enclosure Simple, Enclosure with the Dilatation, Communication, Reflexion, Concurrent, and Approach to the Sensory.

For *Exility* of the *Voice*, or other *Sounds* : It is certain, that the *Voice* doth pass thorow solid and hard Bodies, if they be not too thick ; and thorow *Water*, which is likewise a very close Body, and such an one as letteth not in *Air*. But then the *Voice* or other *Sound* is reduced, by such passage to a great weakness or *Exility*. If therefore you stop the Holes of a *Hawks Bell*, it will make no ring but a flat noise or rattle. And so doth the *Aëtities* or *Eagles Stone*, which hath a little stone within it.

154.

And as for *Water*, it is a certain Tryal : Let a man go into a *Bath*, and take a *Pail* and turn the bottom upward, and carry the mouth of it (even) down to the level of the *Water*, and so press it down under the *Water* some handful and an half, still keeping it even, that it may not tilt on either side, and so the *Air* get out. Then let him that is in the *Bath*, dive

155.

with his head so far under *Water* as he may put his head into the *Pail*, and there will come as much *Air* bubbling forth, as will make room for his head. Then let him speak, and any that shall stand without, shall hear his voice plainly, but yet made extream sharp and exile, like the voice of *Puppets*: But yet the *Articulate sounds* of the *Words* will not be confounded. Note, that it may be much more handsomly done, if the *Pail* be but over the Mans head above *Water*, and then he cower down, and the *Pail* be pressed down with him. Note, that a man must kneel or sit, that he may be lower than the *Water*. A man would think that the *Sicilian Poet* had knowledge of this *Experiment*; for he saith, that *Hercules's Page Hylas* went with a *Water-pot*, to fill it at a pleasant *Fountain* that was near the shore, and that the *Nymphs* of the *Fountain* fell in love with the Boy, and pulled him under the *Water*, keeping him alive; and that *Hercules* missing his *Page*, called him by his name aloud, that all the shore rang of it; and that *Hylas* from within the *Water* answered his Master; but (that which is to the present purpose) with so small and exile a voice, as *Hercules* thought he had been three miles off, when the *Fountain* (indeed) was fast by.

156. In *Lutes* and *Instruments* of *Strings*, if you stop a *String* high, (whereby it hath less scope to tremble,) the *sound* is more *Treble*, but yet more dead.

157. Take two *Sawcers*, and strike the edge of the one gainst the bottom of the other, within a *Pail* of *Water*, and you shall find that as you put the *Sawcers* lower and lower, the *sound* groweth more flat, even while part of the *Sawcer* is above the *Water*; but that flatness of *sound* is joyned with a harshness of *sound*, which, no doubt, is caused by the inequality of the *sound*, which cometh from the part of the *Sawcer* under the *Water*, and from the part above. But when the *Sawcer* is wholly under the *Water*, the *sound* becometh more clear, but far more low, and as if the *sound* came from a far off.

158. A *soft Bodies* dampeth the *sound*, much more than a *hard*; as if a *Bell* hath cloth or silk wrapped about it, it deadeth the *sound* more than if it were *Wood*. And therefore in *Clericals*, the *Keyes* are lined, and in *Colledges* they use to line the *Table-men*.

159. Tryal was made in a *Recorder* after these several manners. The bottom of it was set against the *Palm* of the *Hand*, stopped with *Wax* round about, set against a *Damask Cushion*, thrust into *Sand*, into *Ashes*, into *Water*, (half an inch under the *Water*) close to the bottom of a *Silver Basin*, and still the *Tone* remained: but the bottom of it was set against a *Woollen Carpet*, a *Lining* of *Plush*, a *Lock* of *Wool*, (though loosely put in;) against *Snow*, and the *sound* of it was quite deaded, and but breath.

160. *Iron* hot produceth not so full a *sound*, as when it is cold; for while it is hot, it appeareth to be more soft, and less resounding. So likewise *warm Water*, when it faileth maketh not so full a *sound* as cold; and I conceive it is softer, and nearer the nature of *Oyl*; for it is more slippery, as may be perceived, in that it scowreth better.

161. Let there be a *Recorder* made with two *Fipples*, at each end one; the *Trunk* of it of the length of two *Recorders*, and the holes answerable towards each end, and let to play the same Lesson upon it, at an *Unison*; and let it be noted, whether the *sound* be confounded, or amplified, or dulled. So likewise let a *Cross* be made of two *Trunks* (thorowout) hollow

hollow, and let two speak or sing, the one long ways the other traverse. And let two hear at the opposite ends; and note, whether the *Sound* be confounded, amplified, or dulled. Which two *instances* will also give light to the *mixture* of *Sounds*, whereof we shall speak hereafter.

A *Bellows*, blown in at the *hole* of a *Drum*, and the *Drum* then stricken, maketh the *Sound* a little flatter, but no other apparent alteration. The cause is manifest; partly for that it hindreth the issue of the *Sound*, and partly for that it maketh the *Air*, being blown together, less moveable.

The *Loudness* and *Softness* of *Sounds*, is a thing distinct from the *Magnitude* and *Exility* of *Sounds*; for a *Base-string*, though softly stricken, giveth the greater *Sound*; but a *Treble-string*, if hard stricken, will be heard much further off. And the cause is, for that the *Base-string* striketh more *Air*, and the *Treble* less *Air*, but with a sharper percussion.

It is therefore the *Strength* of the *Percussion*, that is a principal cause of the *loudness* or *softness* of *Sounds*: As in knocking, harder or softer: Winding of a *Horn*, stronger or weaker; Ringing of an *Hand bell*, harder or softer, &c. And the *Strength* of this *Percussion* consisteth, as much or more, in the *hardness* of the *Body percussed*, as in the *force* of the *Body percussing*: For if you strike against a *Cloth*, it will give a less sound; if against *Wood*, greater; if against a *Metal*, yet a greater; and in *Metals*, if you strike against *Gold*, (which is the more pliant) it giveth the flatter sound; if against *Silver* or *brass*, the more ringing sound. As for *Air*, where it is strongly pent, it matcheth a *hard Body*. And therefore we see in discharging of a *piece*, what a great noise it maketh. We see also, that the *Charge* with *Bullet*, or with *Paper* wet, and hard stopped; or with *Powder* alone rammed in hard, maketh no great difference in the *loudness* of the report.

The *sharpness* or *quickness* of the *Percussion*, is a great cause of the *loudness*, as well as the *Strength*: As in a *Whip* or *Wand*, if you strike the *Air* with it, the sharper and quicker you strike it, the *louder* sound it giveth. And in playing upon the *Lute* or *Virginals*, the quick stroke or touch is a great life to the *Sound*. The cause is, for that the quick striking cutteth the *Air* speedily, whereas the soft striking, doth rather beat than cut.

The *Communication* of *Sounds* (as in *Bellies* of *Lutes*, empty *Vessel*, &c.) hath been touched obiter, in the *Majoration* of *Sounds*. But it is fit also to make a *Title* of it apart.

The *Experiment*, for greatest *Demonstration* of *Communication* of *Sounds*, is the *Chiming* of *Bells*; where, if you strike with a *Hammer* upon the upper part, and then upon the midst, and then upon the lower, you shall find the *sound* to be more *Treble*, and more *Base*, according unto the concave on the inside, though the *Percussion* be onely on the outside.

When the *Sound* is created between the *Blast* of the *Mouth*, and the *Air* of the *Pipe*, it hath nevertheless some *communication* with the matter of the sides of the *Pipe*, and the *spirits* in them contained: For in a *Pipe* or *Trumpet* of *Wood* and *Brass*, the *sound* will be diverse; so if the *Pipe* be covered

192.

163.
Experimentas
in Consort
touching the
Loudness or
Softness of
Sounds, and
their Carriage
at longer or
shorter distance.

164.

165.

Experiments
in Consort
touching the
Communicati-
on of Sounds.

166.

167.

168.

with *Cloth* or *Silk*, it will give a diverse *Sound* from that it would do of it self; so if the *Pipe* be a little *wet* on the *inside*, it will make a differing *Sound*, from the same *Pipe* dry.

That *Sound* made within *Water*, doth communicate better with a hard Body thorow *Water*, than made in *Air*, it doth with *Air*. *Vide Experimentum*, 134.

Experiments
in Consort
touching the
Equality and
Inequality of
Sounds.

WE have spoken before (in the *Inquisition* touching *Musick*) of *Musical Sounds*, whereunto there may be a Concord or Discord in two Parts; which *Sounds* we call *Tones*, and likewise of *Immusical Sounds*; and have given the *cause*, that the *Tone* proceedeth of *Equality*, and the other of *Inequality*. And we have also expressed there, what are the *Equal Bodies* that give *Tones*, and what are the *Unequal* that give none. But now we shall speak of such *Inequality of Sounds*, as proceedeth not from the Nature of the Bodies themselves, but accidental, Either from the *Roughness* or *Obliquity* of the *Passage*, or from the *Doubling* of the *Percutient*, or from the *Trepidation* of the *Motion*.

169.

A *Bell*, if it have a *Rift* in it, whereby the *Sound* hath not a clear passage, giveth a *harsh* and *jarring Sound*; so the *Voice of Man*, when by cold taken, the *Wesil* groweth rugged, and (as we call it) furred, becometh hoarse. And in these two *instances*, the *Sounds* are ingrate, because they are meerly *unequal*; but if they be *unequal in equality*, then the *Sound* is Grateful, but Purling.

170.

All *Instruments* that have either *Returns*, as *Trumpets*; or *Flexions*, as *Cornets*; or are *drawn up*, and *put from*, as *Sackbuts* have a *Purling Sound*; But the *Recorder* or *Flute* that have none of these *Inequalities*, give a clear *Sound*. Nevertheless, the *Recorder* it self or *Pipe*, moistened a little in the *inside*, soundeth more solemnly, and with a little Purling or Hissing. Again, a *Wreathed String*, such as are in the *Base Strings of Bandoraes*, giveth also a *Purling Sound*.

171.

But a *Lute-string*, if it be meerly *unequal* in his parts, giveth a harsh and untuneable *Sound*, which *strings* we call *false*, being bigger in one place than in another; and therefore *Wire-strings* are never *false*. We see also, that when we try a *false Lute-string*, we use to extend it hard between the *Fingers*, and to fillip it; and if it giveth a double *species* it is *true*; but if it giveth a trebble or more, it is *false*.

172.

Waters, in the *noise* they make, as they run, represent to the *Ear* a *trembling noise*; and in *Regals* (where they have a *Pipe*, they call the *Nightingale-Pipe*, which containeth *Water*) the *Sound* hath a continual trembling. And *Children* have also little things they call *Cocks*, which have *water* in them; and when they blow, or whistle in them, they yield a *trembling noise*, which *Trembling of Water*, hath an affinity with the Letter *L*. All which *Inequalities of Trepidation*, are rather pleasant, than otherwise.

173.

All *Base Notes*, or very *Treble Notes*, give an *Asper Sound*; for that the *Base* striketh more *Air*, than it can well strike equally; and the *Treble* cutteth the *Air* so sharp, as it returneth too swift, to make the *Sound* equal, and therefore a *Mean* or *Tenor* is the sweetest part.

174.

We know nothing, that can at pleasure make a *Musical* or *Immusical Sound* by Voluntary *Motion*, but the *Voice of Man* and *Birds*. The *cause* is no doubt) in the *Wesil* or *Wind-Pipe*, (which we call *Aspera Arteria*),

which,

which being well extended, gathered *equality*; as a Bladder that is wrinkled, if it be extended, becometh smooth. The extension is always, more in *Tones*, than in *Speech*; therefore the *inward voice* or *whisper*, can never give a *Tone*. And in *singing*, there is (manifestly) a greater working and labor of the Throat, than in *speaking*; as appeareth in the thrusting out, or drawing in of the Chin, when we sing.

The *Humming* of Bees is an *unequal buzzing*, and is conceived by some of the Ancients, not to come forth at their Mouth, but to be an *inward sound*; but (it may be) it is neither, but from the motion of their Wings; for it is not heard, but when they stir.

All *Metals* quenched in *Water*, give a sibilation or hissing sound (which hath an affinity with the Letter *Z*;) notwithstanding the *sound* be created between the *Water* or *Vapor*, and the *Air*. *Seething* also, if there be but small store of *Water* in a Vessel, giveth a hissing sound; but *boiling* in a full Vessel, giveth a bubbling sound, drawing somewhat near to the *Cocks* used by Children.

Tryal would be made, whether the *Inequality*, or interchange of the *Medium*, will not produce an *Inequality* of *Sound*; as if three *Bells* were made one within another, and *Air* betwixt each; and then the uttermost *Bell* were chimed with a Hammer, how the *Sound* would differ from a simple *Bell*. So likewise take a *Plate* of *Brass*, and a *Plank* of *Wood*, and joyn them close together; and knock upon one of them, and see if they do not give an *unequal Sound*. Somake two or three *Partitions* of *Wood* in a *Hoghead*, with *Holes* or *Knots* in them; and mark the difference of their *Sound*, from the *Sound* of an *Hoghead*, without such *Partitions*.

IT is evident, that the *Percussion* of the *Greater Quantity* of *Air*, causeth the *Basfer Sound*; and the less *Quantity*, the more *Treble Sound*. The *Percussion* of the *Greater Quantity* of *Air*, is produced by the *Greatnesse* of the *Body Percussing*; by the *Latitude* of the *Concave*, by which the *Sound* passeth, and by the *Longitude* of the same *Concave*. Therefore we see, that a *Base string*, is greater than a *Treble*; A *Base-pipe* hath a greater bore than a *Treble*: And in *Pipes*, and the like, the lower the *Note holes* be, and the further off from the Mouth of the *Pipe*, the more *Base Sound* they yield; and the nearer the Mouth, the more *Treble*. Nay more, if you strike an *Entire Body*, as an *Andiron* of *Brass*, at the stop it maketh a more *Treble Sound*, and at the bottom a *Basfer*.

178.
Experiments
in Consort
touching the
more *Treble*,
and the more
Base Tones or
Musical
Sounds.

It is also evident, that the *Sharper* or *Quicker Percussion* of *Air*, causeth the more *Treble Sound*; and the *Slower* or *Heavier*, the more *Base Sound*. So wee see in *Strings*, the more they are wound up and strained (and thereby give a more quick start back) the more *Treble* is the *Sound*; and the flacker they are, or less wound up, the *Basfer* is the *Sound*. And therefore a bigger *string* more strained, and a lesser *String*, less strained, may fall into the same *Tone*.

179.

Children, *Women*, *Eunuchs*, have more small and shril *Voices* than *Men*. The reason is, not for that *Men* have greater heat, which may make the *Voice* stronger, (for the strength of a *Voice* or *Sound*, doth make a difference in the *Lowdness* or *Softness*, but not in the *Tone*;) but from the dilatation of the Organ, which (it is true) is likewise caused by heat; but the cause of *Changing* the *Voice* at the years of puberty, is most obscure. It seemeth to be for that, when much of the moisture of the Body, which did before irrigate

198.

the

the Parts, is drawn down to the Spermatical Vessels, it leaveth the Body more hot than it was; whence cometh the dilatation of the Pipes: For we see plainly all effects of Heat do then come on; as Pilosity, more roughness of the skin, hardness of the flesh, &c.

181. The industry of the *Musitian*, hath produced two other means of *Straining*, or *Intension* of *Strings*, besides their *Winding up*. The one is the *stopping* of the *String* with the *Finger*; as in the Necks of Lutes, Viols, &c. The other is the *Shortness* of the *String*; as in Harps, Virginals, &c. Both these have one and the same reason, for they cause the *String* to give a quicker start.

182. In the *straining* of a *String*, the further it is strained, the less *superstraining* goeth to a *Note*: For it requireth good winding of a *String*, before it will make any *Note* at all. And in the stops of Lutes, &c. the higher they go, the less distance is between the *Frets*.

183. If you fill a *Drinking Glass* with *Water*, (especially one sharp below, and wide above) and fillip upon the *Brim*, or outside; and after, empty part of the *Water*, and so more and more, and still try the *Tone* by fillipping; you shall find the *Tone* fall, and be more *Base*, as the *Glass* is more empty.

Experiments
in Consort
touching the
Proportion of
Treble and
Base Tones.

THE just and measured *Proportion* of the *Air percussed*, towards the *Baseness* or *Trebleness* of *Tones*, is one of the greatest secrets in the *Contemplation of Sounds*. For it discovereth the true *Coincidence* of *Tones* into *Diapasons*, which is the return of the same *Sound*. And so of the *Concords* and *Discords*, between the *Unison* and *Diapason*; which we have touched before in the *Experiments of Musick*, but think fit to resume it here as a principal part of our *Inquiry*, touching the *Nature of Sounds*. It may be found out in the *Proportion* of the *Winding* of *Strings*, in the *Proportion* of the *Distance* of *Frets*, and in the *Proportion* of the *Concave* of *Pipes*, &c. But most commodiously in the last of these.

184. Try therefore the *Winding* of a *String* once about, as soon as it is brought to that extension as will give a *Tone*, and then of twice about, and thrice about, &c. And mark the scale or difference of the *Rise* of the *Tone*, whereby you shall discover in one, two effects; both the *Proportion* of the *Sound* towards the *Dimension* of the *Winding*, and the *Proportion* likewise of the *Sound* towards the *String*, as it is more or less strained. But note that to measure this, the way will be to take the length in a right line of the *String*, upon any *Winding* about of the *Peg*.

185. As for the *Stops*, you are to take the number of *Frets*, and principally the length of the *Line*, from the first stop of the *String*, unto such a stop as shall produce a *Diapason* to the former stop, upon the same *String*.

186. But it will best (as it is said) appear in the *Bores of Wind-Instruments*; and therefore cause some half dozen *Pipes* to be made in length, and all things else a like, with a single, double, and so one to a sextuple *Bore*; and so mark what fall of *Tone* every one giveth. But still in these three last instances you must diligently observe, what length of *String*, or distance of *Stop*, or concave of *Air*, maketh what rise of *Sound*. As in the last of these (which, as we said, is that which giveth the aptest demonstration) you must set down what increase of *Concave* goeth to the making of a *Note* higher, and what of two *Notes*, and what of three *Notes*, and so up to the *Diapason*: For then the great secret of *Numbers* and *Proportions* will appear. It is not unlike

unlikely, that those that make *Recorders*, &c. know this already; for that they make them in Sets. And likewise *Bell-founders* in fitting the tune of their Bells: So that enquiry may save tryal. Surely, it hath been observed by one of the *Antients*, that an *empty Barrel* knocked upon with the finger, giveth a *Diapason* to the *Sound* of the like *Barrel full*: But how that should be, I do not well understand, for that the knocking of a *Barrel full or empty*, doth scarce give any *Tone*.

There is required some sensible difference in the *Proportion* of creating a *Note* towards the *sound* it self, which is the *Passive*, and that it be not too near but at a distance: For in a *Recorder*, the three uppermost holes yield one *Tone*, which is a *Note* lower than the *Tone* of the first three. And the like (no doubt) is required in the winding or stopping of *strings*.

187.

THere is another difference of *Sounds*, which we call *Exterior* and *Interior*. It is not *Soft* nor *Loud*; nor it is not *Base*, nor *Treble*; nor it is not *Atasteal*, nor *Immusal*. Though it be true, that there can be no *Tone* in an *Interior sound*, but on the other side, in an *Exterior sound*, there may be both *Musical* and *Immusal*. We shall therefore enumerate them, rather than precisely distinguish them; though to make some adumbration of (that we mean) the *Interior*, is rather an *Impulsion* or *Contusion* of the *Air*, than an *Elyssion* or *Section* of the same; so as the *Percussion* of the one towards the other, differeth as a *Blow* differeth from a *Cut*.

Experiments
in Confort
touching
Exterior and
Interior
SOUNDS.

In *speech of Man*, the *Whispering*, (which they call *Susurrus* in *Latine*,) whether it be louder or softer, is an *Interior sound*; but the *Speaking out*, is an *Exterior sound*: And therefore you can never make a *Tone*, nor sing in *Whispering*; But in *speech* you may. So *Breathing*, or *Blowing* by the *Mouth*, *Bellows*, or *Wind*, (though loud) is an *Interior sound*; but the blowing thorow a *Pipe*, or *Concave* (though soft) is an *Exterior*. So likewise, the greatest *Winds*, if they have no coarctation, or blow not hollow, give any *Interior sound*; The whistling or hollow *Wind*, yieldeth a singing, or *Exterior sound*; the former being pent by some other *Body*, the latter being pent in by his own *Density*: And therefore we see, That when the wind bloweth hollow, it is a sign of *Rain*; the flame, as it moveth within it self, or is blown by a *Bellows* giveth a murmur or *Interior sound*.

188.

There is no *hard Body*, but struck against another *hard Body*, will yield an *Exterior sound*, greater or lesser inasmuch, as if the *Percussion* be over-soft, it may induce a nullity of *sound*, but never an *Interior sound*; as when one treadeth so softly, that he is not heard.

189.

Where the *Air* is the *Percutient* pent or not pent, against a *hard Body*, it never giveth an *Exterior sound*; as if you blow strongly with a *Bellows* against a *Wall*.

190.

Sounds (both *Exterior* and *Interior*) may be made as well by *Suction* as by *Emission* of the *Breath*, as in *Whistling*, or *Breathing*.

191.

It is evident, and it is one of the strangest secrets in *sounds*; that the *whole sound* is not in the *whole Air* onely, but the *whole sound* is also in every small *Part* of the *Air*. So that all curious diversity of the *Articulate*

192.

Experiments
in Confort
touching
Articulation
of SOUNDS.

culate sounds of the voice of Man, or Birds will enter at a small crany, in-
confused.

193. The *unequal agitation* of the *Winds*, and the like, though they be ma-
terial to the carriage of the *sounds*, further or less way; yet they do not
confound the *Articulation* of them at all, within that distance that they can
be heard, though it may be, they make them to be heard less way, than in
a still, as hath been partly touched.

194. Over-great distance confoundeth the *Articulation* of *Sounds*, as we
see, that you may hear the *Sound* of a Preachers voice, or the like, when
you cannot distinguish what he saith. And one *Articulate sound* will con-
found another, as when many speak at once.

195. In the *Experiment* of *speaking under Water*, when the voice is reduced to
such an extream exility, yet the *Articulate sounds* (which are the *words*)
are not confounded, as hath been said.

196. I conceive that an *extream small*, or an *extream great sound*, can-
not be *Articulate*, but that the *Articulation* requireth a *mediocrity* of
sound: For that the *extream small sound* confoundeth the *Articulation*
by *contracting*, and the *great sound* by *dispersing*; and although
(as was formerly said) a *Sound Articulate*, already created, will be con-
tracted into a small crany, yet the first *Articulation* requireth more di-
mension.

197. It hath been observed, that in a *Room*, or in a *Chappel*, Vaulted
below, and Vaulted likewise in the Roof, a Preacher cannot be heard so
well, as in the like places not so vaulted. The cause is, for that the *sub-
sequent words* come on, before the *precedent words* vanish; and there-
fore the *Articulate Sounds* are more confused, though the gross of the *Sound*
be greater.

198. The *Motions* of the *Tongue*, *Lips*, *Throat*, *Palate*, &c. which go to the
making of the several *Alphabetical Letters* are worthy inquiry, and perti-
nent to the present *Inquisition* of *Sounds*: But because they are subtil and
long to describe, we will refer them over, and place them amongst the
Experiments of *Speech*. The *Hebrews* have been diligent in it, and have
assigned which *Letters* are *Labial*, which *Dental*, which *Guttural*, &c. As
for the *Latins* and *Grecians*, they have distinguished between *Semi-vowels*
and *Mutes*; and in *Mutes*, between *Muta*, *Tenuis*, *Media* and *Aspirata*, not
amiss, but yet not diligently enough. For the special *strokes* and *moti-
tions* that create those *Sounds*, they have little inquired; as that the
Letters, *B. P. F. M.* are not expressed, but with the *contracting* or *shut-
ting* of the *Mouth*; that the *Letters* *N.* and *R.* cannot be pronounced, but
that the *Letter N.* will turn into *M.* as *Hecatonba* will be *Hecatomba*. That
M. and *T.* cannot be pronounced together, but *P.* will come between;
as *Emtus*, is pronounced *Emptus*, and a number of the like: So that if
you enquire to the full, you will find, that to the making of the whole
Alphabet, there will be fewer *simple Motions* required, then there are
Letters.

199. The *Lungs* are the most spongy part of the Body, and therefore ablest
to contract and dilate it self; and where it contracteth it self, it expelleth
the *Air*, which thorow the *Artire*, *Throat*, and *Mouth*, maketh the *Voice*.
But yet *Articulation* is not made, but with the help of the *Tongue*, *Pallate*,
and the rest of those they call *Instruments* of *Voice*.

There is found a Similitude between the *Sound* that is made by *Inani-
mate*

There is found a Similitude between the *Sound* that is made by *Inanimate Bodies*, or by *Animate Bodies*, that have no *Voice Articulate*, and divers *Letters* of *Articulate Voices*; and commonly Men have given such names to those *Sounds* as do allude unto the *Articulate Letters*. As *Trembling* of *Water* hath resemblance with the *Letter L*. *Quenching* of *Hot Metals* with the *Letter Z*. *Snarling* of *Dogs* with the *Letter R*. The *Noise* of *Scratch-Owls* with the *Letters Sh*. *Voice* of *Cats* with the *Diphthong En*. *Voice* of *Cuckoos* with the *Diphthong Ou*, *Sounds* of *Strings* with the *Letters Ng*. So that if a Man (for curiosity or strangeness sake) would make a *Puppet*, or other dead Body, to pronounce a *Word*: Let him consider on the one part, the motion of the *Instruments* of *Voice*; and on the other part, the like *Sounds* made in *Inanimate Bodies*; and what Conformity there is, that causeth the Similitude of *Sounds*; and by that he may minister light to that effect.



N A T U R A L.



NATURAL HISTORY;

Century. III.



ALL *Sounds* (whatsoever) move round, that is to say, On all sides, Upwards, Downwards, Forwards and Backwards: This appeareth in all Instances.

Sounds do not require to be conveyed to the Sense in a *Right line*, as *Visibles* do, but may be arched, though it be true they move strongest in a *Right line*; which nevertheless is not caused by the *Rightness* of the *Line*, but by the shortness of the distance. *Linea rectea brevissima*. And therefore, we see if a *Wall* be between, and you speak on the one side, you hear in the other; which is not because the sound passeth thorow the *Wall*, but arched over the *Wall*.

If the *Sound* be Stopped and Repercussed, it cometh about on the other side, in an *Oblick Line*: So, if in a *Coach*, one side of the *Boot* be down, and the other up, and a *Begger* beg on the close side, you would think that he were on the open side. So likewise, if a *Bell* or *Clock*, be (for example) on the North-side of a *Chamber*, and the *Windows* of that *Chamber* be upon the South: he that is in the *Chamber*, will think the *Sound* came from the South.

Sounds, though they spread round, (so that there is an *Orb*, or *spherical-Area* of the *Sound*) yet they move strongest, and go furthest in the *Fore-Lines*, from the first Local Impulsion of the *Air*. And therefore in *Preaching*, you shall hear the *Preachers* voice better before the *Pulpit* than behind it, or on the sides, though it stand open. So a *Harquebus* or *Ordnance* will be further heard forwards, from the mouth of the *Pièce*, than backwards, or on the sides.

It may be doubted, that *Sounds* do move better downwards, than upwards. *Pulpits* are placed high above the people: And when the Ancient

201.
Experiments
in Consort,
touching the
Motions of
Sound, in
what Lines
they are Cir-
cular, Oblick,
Straight, Up-
wards, Down-
wards, For-
wards, Back-
wards.

202.
203.

204.

205.

Generals

Generals spake to their Armies, they had ever a Mount of Turff cast up, whereupon they stood. But this may be imputed to the stops and obstacles which the voice meeteth with, when one speaketh upon the level. But there seemeth to be more in it; for it may be, that *Spiritual Species*, both of *things visible*, and *sounds*, do move better *downwards* than *upwards*. It is a strange thing, that two Men standing below on the ground, those that be on the top of *Pauls*, seem much less than they are, and cannot be known: But to Men above, those below seem nothing so much lessened, and may be known; yet it is true, That all things to them above, seem also somewhat contracted and better collected into figure; as *Knots* in *Gardens* shew best from an upper Window or Tarras.

206.

But to make an exact tryal of it, let a Man stand in a *Chamber*, not much above the Ground, and speak out at the Window thorow a *Trunck*, to one standing on the Ground, as softly as he can, the other laying his Ear close to the *Trunck*: Then *Viâ Versa*, let the other speak below, keeping the same proportion of softness; and let him in the Chamber lay his Ear to the *Trunck*. And this may be the aptest means to make a Judgment, whether Sounds descend or ascend better.

207.
Experiments
in Consort,
touching the
Lasting and
Perishing of
Sounds; and
touching the
time they re-
quire to their
Generation or
Delation.

After that *Sound* is created (which is in a moment) we find it continueth some small time, melting by little and little. In this there is a wonderful error amongst Men, who take this to be a *Continuance* of the first Sound; whereas (in truth) it is a *Renovation*, and not a *Continuance*: For the *Body percussed*, hath by reason of the *Percussion*, a *Trepidation* wrought in the *minute parts*, and so reneweth the *Percussion* of the *Air*. This appeareth manifestly, because that the Melting *Sound* of a Bell, or of a string stricken, which is thought to be a *Continuance*, ceaseth as soon as the Bell or string are touched. As in a Virginal, as soon as ever the Jack falleth, and toucheth the string, the sound ceaseth; and in a Bell, after you have chimed upon it, if you touch the Bell, the *sound* ceaseth. And in this you must distinguish, that there are two *Trepidations*, The one Manifest and Local; as of the Bell, when it is *Pensile*; the other Secret, of the Minute parts, such as is described in the ninth Instance. But it is true, that the *Local* helpeth the *Secret* greatly. We see likewise, that in Pipes, and other Wind Instruments, the *Sound* lasteth no longer than the breath bloweth. It is true, that in Organs there is a confused murmur for a while, after you have played, but that is but while the Bellows are in falling.

208.

It is certain, that in the *noise* of great *Ordinance*, where many are shot off together, the *Sound* will be carried (at the least) twenty miles upon the Land, and much further upon the Water, but then it will come to the Ear; not in the instant of the shooting off, but it will come an hour, or more later: This must needs be a *Continuance* of the *First sound*; for there is no *Trepidation* which should renew it. And the touching of the *Ordinance* would not extinguish the sound the sooner: So that in great Sounds, the continuance is more than momentary.

209.

To try exactly the time wherein Sound is delated, Let a Man stand in a Steeple, and have with him a Taper, and let some Veil be put before the Taper, and let another Man stand in the Field a mile off: then let him in the Steeple strike the Bell, and in the same instant withdraw the Veil, and so let him in the Field tell by his Pulse, what distance of time there is between the Light seen, and the Sound heard: For it is certain, That the Delation of
Light

Light is an instant. This may be tried in far greater distances, allowing greater *Lights* and *Sounds*.

It is generally known and observed, that *Light*, and the *Object* of *Sight*, move swifter than *Sound*; for we see the *flash* of a piece is seen sooner than the *noise* is heard. And in hewing Wood, if one be some distance off, he shall see the Arm lifted up for a second stroke, before he hear the *noise* of the first; and the greater the distance, the greater is the prevention: As we see in Thunder, which is far off, where the Lightning precedeth the crack, a good space.

Colours, when they represent themselves to the Eye, fade not, nor melt not by degrees, but appear still in the same strength; but *Sounds* melt, and vanish by little and little. The cause is, for that *Colours* participate nothing with the *Motion* of the *Air*, but *Sounds* do. And it is a plain argument that *Sound* participateth of some *Local Motion* of the *Air*, (as a cause *Sine qua non*) in that it perisheth so suddenly: For in every Section, or impulsion of the *Air*, the *Air* doth suddenly restore and reunite it self, which the *Water* also doth, but nothing so swiftly.

IN the tryals of the *Passage*, or not *Passage* of *Sounds*, you must take heed you mistake not the *passing* by the sides of a *Body*, for the *passing* thorow a *Body*; and therefore you must make the *Intercepting* *Body* very close; for *Sound* will pass thorow a small chink.

Where *Sound* passeth thorow a *hard*, or close *Body* (as thorow *Water*, thorow a *Wall*, thorow *Metal*, as in hawks Bells stopped, &c.) the *hard* or close *Body*, must be but thin and small; for else it deadeth and extinguisheth the *Sound* utterly. And therefore, in the *Experiment* of *Speaking* in *Air under Water*, the voice must not be very deep within the *Water*: for then the *Sound* pierceth not. So if you speak on the further side of a *Close Wall*, if the *Wall* be very thick, you shall not be heard: And if there were an Hogs head empty, whereof the sides were some two foot thick, and the Bung hole stopped. I conceive, the resounding sound by the *Communication* of the outward *Air*, with the *Air within*, would be little or none, but onely you shall hear the *noise* of the outward knock, as if the *Vessel* were full.

It is certain, that in the *passage* of *Sounds* thorow *hard Bodies*, the Spirit or *Pneumatical* part of the *hard Body* it self doth co-operate; but much better, when the sides of the *hard Body* are struck, than when the percussio is onely within, without touch of the sides. Take therefore a Hawks Bell, the holes stopped up, and hang it by a thred within a Bottle-Glass, and stop the Mouth of the Glass very close with Wax, and then shake the Glass, and see whether the Bell give any *Sound* at all, or how weak? But note, that you must instead of the Thred take a *Wire*, or else let the Glass have a great Belly, lest when you shake the Bell, it dash upon the sides of the Glass.

It is plain that a very long and down-right arch for the *Sound* to pass, will extinguish the *Sound* quite, so that that *Sound*, which would be heard over a *Wall*, will not be heard over a *Church*; nor that *Sound*, which will be heard, if you stand some distance from the *VVall*, will be heard if you stand close under the *VVall*.

Soft and *Foraminous bodies*, in the first creation of the *Sound*, will dead it; for the striking against Cloth and Fur, will make little *Sound*, as hath been said: But in the *passage* of the *Sound*, they will admit it better than *harder bodies*, as we see that Curtains and hangings will not stay the *Sounds* much; but Glass windows, if they be very close, will check a sound more, than the like thickness of Cloth. We see also in the rumbling of the Belly, how easily the *Sound* passeth thorow the Guts and Skin,

210.

211.

Experiments in Consort touching the Passage and Interceptions of Sounds.

212.

213.

214.

215.

216.

It is worthy the inquiry, whether *Great sounds* (as of Ordnance or Bells) become not more *Weak* and *Exile*, when they pass thorow *small Crannies*. For the *subtilties* of *Articulate sounds*, (it may be) may pass thorow *small Crannies*, not confused; but the *magnitude* of the *Sound* (perhaps) not so well.

217.

Experiments
in Consort
touching the
Medium of
Sounds.

The *Mediums* of *Sounds*, are *Air*, *soft* and *Porous bodies*; also *Water*, and *hard Bodies* refuse not altogether to be *Mediums* of *Sounds*. But all of them are dull and unapt *Differents*, except the *Air*.

218.

In *Air*, the thinner or drier *Air*, carrieth not the *Sound* so well, as the more dense; as appeareth in *Night sounds*, and *Evening sounds*, and *Sounds* in moist *Weather*, and *Southern Winds*. The reason is already mentioned in the *Title* of *Majoration* of *Sounds*; being, for that *thin Air* is better pierced, but *thick Air* preserveth the *Sound* better from wast: Let further tryal be made by hollowing in *Mists*, and gentle *showers*; for (it may be) that will somewhat dead the *Sound*.

219.

How far forth *Flame* may be a *Medium* of *Sound* (especially of such *Sounds* as are created by *Air*; and not betwixt *hard Bodies*) let it be tried in *speaking*, where a *Bonfire* is between; but then you must allow for some disturbance, the *noise* that the *Flame* it self maketh.

220.

Whether any other *Liquors*, being made *Mediums*, cause a diversity of *Sound* from *Water*, it may be tryed: As by the knapping of the *Tongs*, or striking of the bottom of a *Vessel* filled either with *Milk* or with *Oyl*; which, though they be more light, yet are they more unequal *Bodies* than *Air*.

Of the *Natures* of the *Mediums*, we have now spoken; as for the *Disposition* of the said *Mediums*, it doth consist in the *Penning*, or not *Penning* of the *Air*; of which, we have spoken before in the *Title* of *Delation* of *Sounds*. It consisteth also in the *Figure* of the *Concave*, through which it passeth. Of which, we will speak next.

Experiments
in Consort,
what the Fi-
gures of the
Pipes or Con-
caves, or the
Bodies diffe-
rent conduce
to the Sounds

How the *Figures* of *Pipes* or *Concaves*, through which *Sounds* pass, or of other *Bodies* different; conduce to the variety and alteration of the *Sounds*; either in respect of the *Greater quantity*, or *less quantity* of *Air*, which the *Concaves* receive; or in respect of the *carrying* of *Sounds* longer or shorter way; or in respect of many other *Circumstances*, they have been touched, as falling into other *Titles*. But those *Figures* which we now are to speak of, we intend to be, as they concern the *Lines*, through which *Sound* passeth: As *Straight*, *Crooked*, *Angular*, *Circular*, &c.

221.

The *Figure* of a *Bell* partaketh of the *Pyramis*, but yet coming off, and dilating more suddenly. The *Figure* of a *Hunter's horn*, and *Cornet*, is oblick, yet they have likewise *straight Horns*; which, if they be of the same bore with the *Oblick*, differ little in *Sound*, save that the *straight* require somewhat a *Stronger blast*. The *Figures* of *Recorders*, and *Flutes*, and *Pipes*, are *straight*; but the *Recorder* hath a less bore and a greater, above and below. The *Trumpet* hath the *Figure* of the *Letter S*, which maketh that *Purling Sound*, &c. Generally, the *Straight line* hath the cleanest and roundest *Sound*, and the *Crooked* the more hoarse, and Jarring.

222.

Of a *Sinuous Pipe*, that may have some four *Flexions*, tryal would be made. Likewise of a *Pipe* made like a *Cross*, open in the midst; and so likewise

likewise of an *angular Pipe*; and see what will be the effects these several *Sounds*. And so again of a *Circular pipe*: As if you take a *Pipe* perfect round, and make a hole whereinto you shall blow, and another hole not far from that; but with a traverse or stop between them: So that your breath may go the Round of the *Circle*, and come forth at the second hole. You may try likewise *Percussions* of *solid Bodies* of several *Figures*: As *Globes, Flats, Cubes, Crosses, Triangles, &c.* And their *Combinations*; as *Flat* against *Flat*, and *Convex* against *Convex*, and *Convex* against *Flat, &c.* And mark well the diversities of the *Sounds*. Try also the difference in *Sound* of several *Crafftitudes* of *Hard bodies* percussed, and take knowledge of the diversities of the *Sounds*. I may self have tried, That a *Bell* of *Gold* yieldeth an excellent *Sound*, not inferior to that of *Silver* or *Brass*, but rather better. Yet we see that a piece of money of *Gold*, soundeth far more flat than a piece of money of *Silver*.

223.

The *Harp* hath the *Concave*, not along the *strings*, but a cross the *strings*; and no *Instrument* hath the *Sound* so melting and prolonged, as the *Irish Harp*. So as I suppose, that if a *Virginal* were made with a double *Concave*; the one all the length as the *Virginal* hath, the other at the end of the *strings*, as the *Harp* hath; it must needs make the *Sound* perfecter, and not so shallow, and jarring. You may try it without any *Sound-board* along, but onely *Harp-wise*, at one end of the *strings*; or lastly, with a double *Concave*, at each end of the *strings* one.

224.

Experiments
in Consort
touching the
mixture of
Sounds.

There is an apparent diversity between the *Species Visible* and *Audible*, in this. That the *Visible* doth not mingle in the *Medium*, but the *Audible* doth. For if we look abroad, we see *Heaven*, a number of *Stars, Trees, Hills, Men, Beasts*, at once; and the *Species* of the one, doth not confound the other: But if so many *Sounds* come from several parts, one of them would utterly confound the other. So we see, that *Voices* or *Consorts* of *Musick* do make a harmony by *mixture*, which *Colours* do not. It is true nevertheless, that a great *Light* drowneth a smaller, that it cannot be seen; as the *Sun* that of a *Glowworm*, as well as a great *Sound* drowneth a lesser. And, I suppose likewise, that if there were two *Lanterns* of *Glass*, the one a *Crimsin*, and the other an *Azure*, and a *Candle* within either of them, those *Coloured Lights*, would mingle and cast upon a *White Paper*, a *Purple Colour*. And even in *Colours*, they yield a faint and weak *mixture*: for *White Walls* make rooms more lightsome, than *Black, &c.* But the cause of the *Confusion* in *Sounds*, and the *Inconfusion* in *Species Visible*, is, For that the *Sight* worketh in right *Lines*, and maketh several *Cones*; and so there can be no *Coincidence* in the eye, or *Visual Point*: But *Sounds* that move in oblick and arcuate *Lines*, must needs encounter, and disturb the one the other.

225.

The sweetest and best *Harmony* is, when every *Part* or *Instrument* is, not heard by it self, but a conflation of them all, which requireth to stand some distance off. Even as it is in the *mixture* of perfumes, or the taking of the smells of several *Flowers* in the *Air*.

226.

The *disposition* of the *Air*, in other *qualities*, except it be joyned with *Sound*, hath no great operation upon *Sounds*: For whether the *Air* be lightsome or dark, hot or cold, quiet or stirring, (except it be with *noise*) sweet smelling, or stinking, or the like; it importeth not much. Some petty alteration or difference it may make.

But

227. But *Sounds* do disturb and alter the one the other: Sometimes the one drowning the other, and making it not heard, sometimes the one jarring and discording with the other, and making a confusion; sometimes the one mingling and compounding with the other, and making an harmony.

228. Two *Voices* of like *Loudness*, will not be heard twice as far, as one of them alone; and two *Candles* of like light, will not make things seem twice as far off, as one. The cause is profound, but it seemeth, that the *Impressions* from the *Objects* of the *Senses* do *Mingle* respectively, every one with his kind; but not in proportion, as is before demonstrated: And the reason may be, because the first *Impression*, which is from *Privative* to *Active*, (as from *Silence* to *Noise*, or from *Darkness* to *Light*) is a greater degree, than from *Less Noise*, to *More Noise*, or from *Less Light*, to *More Light*. And the reason of that again may be, For that the *Air*, after it hath received a charge doth not receive a surcharge, or greater charge, with like appetite, as it doth the first charge: As for the increase of *Virtue* generally, what proportion it beareth to the increase of the *Matter*, it is a large Field, and to be handled by it self.

229.
Experiments
in Consort
touching the
Melioration of
Sounds.

ALL *Reflexions Concurrent*, do make *Sounds* Greater; but if the Body that createth, either the original *Sound*, or the *Reflexion*, be clean and smooth, it maketh them sweeter. Tryal may be made of a *Lute* or *Viol*, with the Belly of polished *Brass* instead of *Wood*. We see, that even in the open *Air*, the *Wire-string* is sweeter than the *String of Guts*. And we see, that for *Reflection Water* excelleth, as in *Musick* near the *Water*, or in *Eccho's*.

230.

It hath been tryed, that a *Pipe*, a little moistned on the inside, but yet so as there be no drops left, maketh a more solemn *Sound*, than if the *Pipe* were dry; but yet with a sweet degree of *Sibilation* or *Purling*, as we touch'd it before in the Title of *Equality*. The cause is, for that all things porous, being superficially wet, and (as it were) between dry and wet, become a little more even and smooth; but the *Purling* (which must needs proceed of *Inequality*) I take to be bred between the smoothness of the inward Surface of the *Pipe* which is wet, and the rest of the *Wood* of the *Pipe*, unto which the wet cometh not, but it remaineth dry.

231.

In *Frosty weather*, *Musick* within doors soundeth better; which may be, by reason not of the disposition of the *Air*, but of the *Wood* or *String* of the *Instrument*, which is made more crisp, and so more porous and hollow; and we see that *Old Lutes* sound better than *New*, for the same reason: And so do *Lute-strings* that have been kept long.

232.

Sound is likewise *Meliorated* by the *Mingling* of open *Air* with pent *Air*: Therefore tryal may be made of a *Lute* or *Viol* with a double Belly, making another Belly with a knot over the string; yet so, as there be room enough for the strings, and room enough to play below that Belly. Tryal may be made also of an *Irish Harp*, with a concave on both sides, whereas it useth to have it but on one side. The doubt may be, lest it should make too much refunding, whereby one Note would overtake another.

233.

If you sing into the hole of a *Drum*, it maketh the *singing* more sweet, And so I conceive it would, if it were a *Song* in Parts sung into several *Drums* and for handsomness and strangeness sake, it would not be amiss to have a *Curtain* between the place where the *Drums* are, and the hearers.

234

When a *Sound* is created in the *Wind-Instruments*, between the *Breath* and *Air*, yet if the *Sound* be communicate with a more equal Body of the *Pipe*, it

it *meliorateth* the Sound. For (no doubt) there would be a differing Sound in a Trumpet or Pipe of Wood, and again, in a Trumpet or Pipe of Brass. It were good to try *Recorders* and *Hunters Horns* of Brass, what the Sound would be.

Sounds are *meliorated* by the *Intension* of the *Sense*, where the *common Sense* is collected most to the *particular Sense* of *Hearing*, and the *Sight* suspended: and therefore Sounds are sweeter (as well as greater,) in the *Night* than in the *Day*; and, I suppose, they are sweeter to blind men, than to others: And it is manifest, that between *sleeping* and *waking*, (when all the *Senses* are bound and suspended) *Musick* is far sweeter than when one is fully *waking*.

IT is a thing strange in nature, when it is attentively considered: How *Children* and some *Birds* learn to *imitate Speech*. They take no mark at all of the *Motion* of the *Mouth* of him that speaketh, for *Birds* are as well taught in the dark, as by light. The *Sounds* of *Speech* are very curious and exquisite; so one would think it were a Lesson hard to learn. It is true, that it is done with time, and by little and little, and with many *Essays* and *proffers*: But all this dischargeth not the wonder. It would make a Man think (though this, which we shall say, may seem exceeding strange) that there is some *Transmission* of *Spirits*, and that the *Spirits* of the *Teacher* put in motion, should work with the *Spirits* of the *Learner*, a pre-disposition to offer to *imitate*, and so to perfect the *imitation* by degrees. But touching *Operations* by *Transmissions* of *Spirits* (which is one of the highest secrets in Nature) we shall speak in due place, chiefly when we come to enquire of *Imagination*. But as for *Imitation*, it is certain, That there is in Men, and other Creatures, a pre-disposition to *Imitate*. We see how ready Apes and Monkeys are to *Imitate* all motions of Man: And in the catching of *Dottrels*, we see how the foolish Bird playeth the Ape in gestures: And no Man (in effect) doth accompany with others, but he learneth (ere he is aware) some Gesture, or Voice, or Fashion, of the other.

In *Imitation* of Sounds, that Man should be the *Teacher*, is no part of the matter: For *Birds* will learn one another, and there is no reward by feeding, or the like, given them for the *imitation*; And besides, you shall have Parrots that will not onely *imitate* Voices, but Laughing, Knocking, Squeaking of a Door upon the Hinges, or of a Cart wheel, and (in effect) any other noise they hear.

No Beast can *imitate* the speech of Man, but *Birds* onely: For the Ape it self, that is so ready to *imitate* otherwise, attaineth not any degree of *imitation* of Speech. It is true, that I have known a Dog, that if one howled in his ear, he would fall a howling a great while. What should be the aptness of *Birds*, in comparison of *Beasts*, to *imitate* the Speech of Man, may be further inquired. We see that *Beasts* have those parts, which they count the *Instruments* of Speech, (as *Lips*, *Teeth*, &c.) liker unto Man than *Birds*. As for the Neck, by which the *Throat* passeth, we see many *Beasts* have it for the length, as much as *Birds*. What better Gorge, or Attire, *Birds* have, may be further inquired. The *Birds* that are known to be speakers, are, *Parrots*, *Pyes*, *Jaws*, *Daws*, and *Ravens*: Of which, *Parrots* have an adunquē Bill, but the rest not.

But I conceive, that the aptness of *Birds* is not so much in the conformity of the *Organs* of Speech, as in their *Attention*. For Speech must come by *Hearing* and *Learning*; and *Birds* give more heed, and mark Sounds

235.

236.
Experiments
in Confort
touching the
Imitation of
Sounds.

237.

238.

239.

more

more than *Beasts*; because naturally they are more delighted with them, and practise them more, as appeareth in their *Singing*. We see also, that those that teach *Birds* to sing, do keep them waking, to increase their *attention*. We see also, that *Cock-birds*, among *Singing-birds*, are ever the better *singers*, which may be, because they are more lively and listen more.

240. *Labor and Intention to Imitate voices*, doth conduce much to *Imitation*: And therefore we see, that there be certain *Pantomimi*, that will represent the *Voices of Players of Interludes*, so to life, as if you see them not, you would think they were those *Players* themselves, and so the *Voices* of other men, that they hear.

241. There have been some that could counterfeit the *distance of Voices*, (which is a *secondary object of Hearing*) in such sort; as when they stand fast by you, you would think the *speech* came from afar off, in a fearful manner. How this is done, may be further enquired; but I see no great use of it, but for *Imposture*, in counterfeiting ghosts or spirits.

Experiments
in Confort
touching the
Reflection of
Sounds.

There be three kinds of *Reflections of Sounds*; a *Reflection concurrent*, a *Reflection Iterant*, which we call *Eccho*, and a *Super-reflection*, or an *Eccho of an Eccho*, whereof the first hath been handled in the *Title of Magnitude of Sounds*. The latter two we will now speak of.

242. The *Reflection of Species Visible by Mirrors*, you may command, because passing in *Right Lines* they may be guided to any point: but the *Reflection of Sounds*, is hard to master, because the *Sound* filling great spaces in *Arch-ed Lines*, cannot be so guided. And therefore, we see, there hath not been practised any means to make *Artificial Eccho's*. And no *Eccho* already known, returneth in a very narrow room.

243. The natural *Eccho's* are made upon *Walls, Woods, Rocks, Hills, and Banks*: As for *Waters* being near, they make a *Concurrent Eccho*; but being further off, (as upon a large *River*) they make an *Iterant Eccho*: For there is no difference between the *Concurrent Eccho*, and the *Iterant*, but the quickness or slowness of the return. But there is no doubt, but *Water* doth help the *Delation of Eccho*, as well as it helpeth the *Delation of Original Sounds*.

244. It is certain (as hath been formerly touched,) that if you speak thorow a *Trunk*, stopped at the further end, you shall find a blast return upon your mouth, but no *Sound* at all. The *Cause* is, for that the *Closeness*, which preserveth the *Original*, is not able to preserve the *Reflected Sound*: besides that *Eccho's* are seldom created, but by loud *Sounds*. And therefore there is less hope of *Artificial Eccho's* in *Air*, pent in a narrow concave. Nevertheless it hath been tryed, that one leaning over a *Well* of twenty five fathoms deep, and speaking, though but softly, (yet not so soft as a whisper) the *Water* returned a good audible *Eccho*. It would be tryed, whether speaking in *Caves* where there is no issue, save where you speak, will not yield *Eccho's* as *Wells* do.

245. The *Eccho* cometh as the *Original Sound* doth in a round *Orb of Air*: It were good to try the creating of the *Eccho*, where the *Body* repercussing maketh an *Angle*: As against the *Return of a Wall, &c.* Also we see that in *Mirrors*, there is the like *Angle of Incidence*, from the *Object* to the *Glass*, and from the *Glass* to the *Eye*. And, if you strike a *Ball* side-long, not full upon the *Surface*, the rebound will be as much the contrary way; whether

ther there be any such *resilience* in *Eccho's* (that is, Whether a Man shall hear better, if he stand aside the Body *repercussing*, than if he stand where he speaketh, or any where in a right line between) may be tried: Tryal likewise would be made, by standing nearer the place of *repercussing*, than he that speaketh; and again, by standing further off, than he that speaketh, and so knowledge would be taken, whether *Eccho's*, as well as *Original sounds*, be not stronger near hand.

There be many places, where you shall hear a number of *Eccho's* one after another; and it is, when there is variety of *Hills* or *Woods*, some nearer, some further off: So that the return from the further, being last created, will be likewise last heard.

246.

As the *Voice* goeth round, as well towards the back, as towards the front of him that speaketh; so likewise doth the *Eccho*, for you have many *Back-Eccho's* to the place where you stand.

247.

To make an *Eccho* that will report three, or four, or five words distinctly, it is requisite, that the *Body repercussing* be a good distance off: For if it be near, and yet not so near, as to make a *Concurrent Eccho*, it choppeth with you upon the sudden. It is requisite likewise, that the *Air* be not much *pent*: For *Air*, at great distance, *pent* worketh the same effect with *Air*, at large, in a small distance. And therefore in the *Tryal* of *Speaking* in the *Well*, though the *Well* was deep, the *Voice* came back suddenly, and would bear the report but of two words.

248.

For *Eccho's* upon *Eccho's*, there is a rare instance thereof in a place, which I will now exactly describe. It is some Three or four Miles from *Paris*, near a Town called *Pant-Charenton*; and some Bird-bolt shot or more from the River of *Sean*. The Room is a *Chappel*, or small *Church*; the Walls all standing, both at the sides, and at the ends; two rows of Pillars after the manner of *Isles* of *Churches*, also standing; the Roof all open, not so much as any Embowment near any of the Walls left. There was against every Pillar, a stack of *Billets* above a Mans height, which the Watermen, that bring *Wood* down the *Sean*, in Stacks, and not in Boats, laid there (as it seemeth) for their ease. Speaking at the one end, I did hear it return the *Voice* Thirteen several times; and I have heard of others, that it would return Sixteen times; for I was there about three of the Clock in the afternoon; and it is best, (as all other *Eccho's* are) in the Evening. It is manifest, that it is not *Eccho's* from several places, but a *tossing* of the *Voice*, as a Ball too and fro; like to *Reflections* in *Looking-Glasses*; where if you place one *Glass* before, and another behind, you shall see the *Glass* behind with the *Image*, within the *Glass* before; and again, the *Glass* before in that: And divers such *Super-Reflections*, till the *Species speciei* at last die: For it is ever yreturn weaker, and more shady. In like manner, the *Voice* in that *Chappel*, createth *Speciem speciei*, and maketh succeeding *Super-Reflections*; for it melteth by degrees, and every *Reflection* is weaker than the former: So that, if you speak three words; it will (perhaps) some three times report you the whole three words, and then the two latter words for sometime, and then the last word alone for sometime, still fading and growing weaker. And whereas in *Eccho's* of one return, it is much to hear Four or five words. In this *Eccho* of so many Returns upon the matter, you hear above Twenty words for three.

249.

The

250. The like *Eccho* upon *Eccho*, but onely with two reports, hath been observed to be, if you stand between a *House* and a *Hill*, and lure towards the *Hill*. For the *House* will give a *Back-Eccho*; One taking it from the other, and the latter the weaker.
251. There are certain *Letters*, that an *Eccho* will hardly express: As *S* for one, especially being principal in a word. I remember well, that when I went to the *Eccho* at *Pont-Charenton*, there was an old *Parisian* that took it to be the Work of Spirits, and of good Spirits: For (said he) call *Satan*, and the *Eccho* will not deliver back the Devils name: But will say, *Vat'en*, which is as much in *French*, as *Apage*, or *Avoid*: And thereby I did hap to find, that an *Eccho* would not return *S*, being but a Hissing and an *Interior Sound*.
252. *Eccho's* are some more sudden, and chop again, as soon as the *Voice* is delivered, as hath been partly said: others are more deliberate, that is, give more space between the *Voice* and the *Eccho*, which is caused by the Local nearness or distance: Some will report a longer train of words, and some a shorter: Some more loud (full as loud as the *Original*, and sometimes more loud) and some weaker and fainter.
253. Where *Eccho's* come from several parts, at the same distance, they must needs make (as it were) a Quire of *Eccho's*, and so make the Report greater, and even a *continued Eccho*; which you shall find in some *Hills* that stand encompassed. Theatre-like,
254. It doth not yet appear, that there is *Refraction* in *Sounds*, as well as in *Species Visible*. For I do not think, that if a *Sound* should pass through divers *Mediums*, as *Air*, *Cloath*, *Wood*, it would deliver the *Sound* in a differing place, from that unto which it is deferred; which is the proper effect of *Refraction*. But *Majoration*, which is also the Work of *Refraction*, appeareth plainly in *Sounds*, (as hath been handled at full) but it is not by diversity of *Mediums*.

Experiments
in Consort
touching the
Consent and
Dissent be-
tween *Visibles*
and *Audibles*

WE have *Obiter*, for Demonstrations sake, used in divers *Instances*, the *Examples* of the *Sight*, and *Things Visible*, to illustrate the *Nature of Sounds*. But we think good now to prosecute that *Comparison* more full.

Consents of Visibles and Audibles.

255. Both of them spread themselves in *Round*, and fill a whole *Floor* or *Orb* unto certain *Limits*; and are carried a great way, and do languish, and lessen by degrees, according to the *Distance* of the *Objects* from the *Sensories*,
256. Both of them have the whole *Species* in every small portion of the *Air* or *Medium*, so as the *Species* do pass through small *Cranies*, without confusion: As we see ordinarily in *Levels*, as to the *Eye*; and in *Cranies*, or *Chinks*, as to the *Sound*.
257. Both of them are of a sudden and easie *Generation* and *Delation*, and likewise perish swiftly and suddenly; as if you remove the *Light*, or teach the *Bodies* that give the *Sounds*.

Both

Both of them do Receive and carry exquisite, and accurate differences; as of Colours, Figures, Motions, Distances, in *Visibles*; and of Articulate Voices, Tones, Songs, and Quaverings in *Audibles*.

258.

Both of them in their Vertue and Working, do not appear to emit any *Corporal substance* into their *Mediums*, or an Orb of their Vertue; neither again to raise or stir any evident *Local Motion* in their *Mediums* as they pass; but onely to carry certain *Spiritual Species*. The perfect knowledge of the cause whereof, being hitherto scarcely attained, we shall search and handle in due place.

259.

Both of them seem not to Generate or Produce any other Effect in Nature, but such as appertaineth to their proper Objects and Senses, and are otherwise barren.

260.

But both of them, in their own proper action, do work three manifest Effects. The first, in that the stronger Species drowneeth the lesser: As the light of the Sun, the light of a Glow-worm, the report of an Ordnance, the Voice. The second, in that an Object of surcharge or excess, destroyeth the Sense: As the light of the Sun the eye, a violent sound (near the Ear), the Hearing. The third, in that both of them will be reverberate: As in Mirrors, and in *Eccho's*.

261.

Neither of them doth destroy or hinder the Species of the other, although they encounter in the same Medium: As Light or Colour hinder not Sound, nor e contra.

262.

Both of them affect the Sense in Living Creatures, and yield Objects of Pleasure and dislike; yet nevertheless, the Objects of them do also (if it be well observed) affect and work upon dead things; namely such, as have some conformity with the Organs of the two Senses: As *Visibles* work upon a Looking-glass, which is like the Pupil of the Eye; and *Audibles* upon the places of *Eccho*, which resemble, in some sort, the cavern and structure of the Ear.

263.

Both of them do diversly work, as they have their Medium diversly disposed. So a Trembling medium (as *Imoak*) maketh the object seem to tremble; and a Rising or Falling Medium (as *Winds*) maketh the Sounds to rise or fall.

264.

To both, the Medium, which is the most propitious and conducive, is Air; For Glass or Water, &c. are not comparable.

265.

In both of them, where the Object is fine and accurate, it conduceth much to have the Sense intentive, and erect; insomuch, as you contract your eye, when you would see sharply, and erect your ear, when you would hear attentively, which in Beasts, that have ears moveable is most manifest.

266.

The Beams of Light, when they are multiplied and conglomerate, generate heat; which is a different action, from the action of Sight: And the Multiplication and Conglomeration of Sounds, doth generate an extreme Rarefaction of the Air; which is an action materiate, differing from the action of Sound. If it be true (which is anciently reported) that Birds, with great shouts, have fallen down.

267.

Dissents of Visibles and Audibles.

268. **T**He *Species of Visibles*, seem to be *Emissions* of *Beams* from the *Object* seen almost like *Odors*, save that they are more incorporeal; but the *Species of Audibles*, seem to participate more with *Local Motion*, like *Percussions* or *Impressions* made upon the *Air*. So that whereas all *Bodies* do seem to work in two manners, Either by the *Communication* of their *Natures*, or by the *impressions* and *Signatures* of their *Motions*. The *Diffusion* of *Species Visible* seemeth to participate more of the former *Operation*, and the *Species Audible* of the latter.

269. The *Species of Audibles* seem to be carried more manifestly thorow the *Air*, than the *Species of Visibles*: For (I conceive) that a contrary strong *Wind* will not much hinder the sight of *Visibles*, as it will do the hearing of *Sounds*.

270. There is one *Difference* above all others, between *Visibles* and *Audibles*, that is the most remarkable; as that whereupon many smaller differences do depend; Namely, that *Visibles* (except *Lights*) are carried in *Right Lines*, and *Audibles* in *Arcuate Lines*. Hence it cometh to pass, that *Visibles* do not intermingle and confound one another, as hath been said before, but *Sounds* do. Hence it cometh, that the solidity of *Bodies* doth not much hinder the sight, so that the *Bodies* be clear, and the *Pores* in a *Right Line*, as in *Glass*, *Crystal*, *Diamonds*, *Water*, &c. But a thin *Scarf* or *Handkerchief*, though they be *Bodies* nothing so solid, hinder the *Sight*: whereas (contrariwise) these *Porous Bodies* do not much hinder the *Hearing*, but solid *Bodies* do almost stop it, or at the least attenuate it. Hence also it cometh, that to the *Reflection* of *Visibles*, small *Glasses* suffice, but to the *Reverberation* of *Audibles* are required greater spaces, as hath likewise been said before.

271. *Visibles* are seen further off, than *Sounds* are heard; allowing nevertheless the *Rate* of their *Bigness*: For otherwise, a *Great Sound* will be heard further off, than a *small Body* seen.

272. *Visibles* require (generally) some *distance* between the *Object*, and the *Eye* to be better seen; whereas in *Audibles*, the nearer the approach of the *Sound* is to the *Sense*, the better; but in this, there may be a double error. The one, because to seeing there is required *Light*, and any thing that toucheth the *Pupil* of the *Eye* (all over) excludeth the *Light*. For I have heard of a person very credible, (who himself was cured of a *Cataract* in one of his *Eyes*) that while the *Silver-needle* did work upon the *Sight* of his *Eye*, to remove the *Film* of the *Cataract*, he never saw any thing more clear or perfect, than that white *Needle*: Which (no doubt) was, because the *Needle* was lesser than the *Pupil* of the *Eye*, and so took not the *Light* from it. The other error may be. For that the *Object* of *Sight* doth strike upon the *Pupil* of the *Eye*, directly without any interception; whereas the *Cave* of the *Ear* doth hold off the *Sound* a little from the *Organ*: and so nevertheless there is some *Distance* required in both.

273. *Visibles* are swifter carried to the *Sense*, than *Audibles*; as appeareth in *Thunder* and *Lightning*; *Flame*, and *Report* of a *Piece*; *Motion* of the *Air*, in hewing of *Wood*. All which have been set down heretofore, but are proper for this *Title*.

I conceive also, that the *Species* of *Audibles*, do hang longer in the Air than those of *Visibles* : For although even those of *Visibles* do hang some time, as we see in *Rings turned*, that shew like spheres. In *Lute-strings* fillipped, a *Firebrand* carried a long, which leaveth a train of light behind it, and in the *Twilight*, and the like : Yet I conceive that *Sounds*, stay longer because they are carried up and down with the Wind ; and because of the distance of the time in *Ordnance discharged*, and heard twenty miles off.

274.

In *Visibles* there are not found objects so odious and ingrate to the *Sense*, as in *Audibles*. For foul *Sights* do rather displease, in that they excite the memory of foul things, than in the immediate Objects. And therefore in *Pictures*, those foul *Sights* do not much offend ; but in *Audibles*, the grateing of a Saw when it is sharpned, doth offend so much, as it setteth the Teeth on edge ; and any of the *Harsh Discords* in *Musicks*, the Ear doth straitwayes refuse.

275.

In *Visibles*, after great light, if you come suddenly into the *Dark*, or contrariwise out of the *Dark* into a *Glaring Light*. The eye is dazeled for a time, and the *Sight* confused, but whether any such effect be after great *Sounds*, or after a *Deep silence* may be better enquired. It is an old Tradition, that those that dwell near the *Cataracts* of *Nilus*, are stricken deaf. But we find no such effect in *Cannoniers*, nor *Millers*, nor those that dwell upon *Bridges*.

276.

277.

It seemeth, that the *Impression* of *Colour* is so weak, as it worketh not, but by a *Cone* of direct *Beams*, or right *Lines*, whereof the *Basis* is in the Object and the *Vertical point* in the *Eye*. So as there is a *corradiation* and *conjunction* of *Beams* ; and those *Beams* so sent forth, yet are not of any force to beget the like borrowed or second *Beams*, except it be by *Reflexion*, whereof we speak not. For the *Beams* pass and give little tincture to that Air which is adjacent ; which if they did, we should see *Colours* out of a right line. But as this is in *Colours*, so otherwise it is in the *Body of Light*. For when there is a *Skreen* between the *Candle* and the *Eye*, yet the *Light* passeth to the *Paper* whereon one writeth, so that the *Light* is seen where the body of the *Flame* is not seen ; and where any *Colour* (if it were placed where the body of the *Flame* is) would not be seen, I judge that *sound* is of this latter nature : For when two are placed on both sides of a *Wall*, and the voice is heard, I judge it is not onely the *Original sound*, which passeth in an *Archd line* ; but the *sound*, which passeth above the *Wall* in a *Right line*, begetteth the like *Motion* round about it, as the first did, though more weak.

278.

Experiments in Consort, touching the Sympathy or Antipathy of Sounds, one with another.

All *Concords* and *Discords* of *Musick* are (no doubt) *Sympathies* and *Antipathies* of *Sounds*, and so (likewise) in that *Musick* which we call *Broken Musick*, or *Consort Musick* ; some *Consorts* of *Instruments* are sweeter than others (a thing not sufficiently yet observed) as the *Irish-Harp* and *Base-Vial* agree well ; the *Recorder* and *Stringed Musick* agree well ; *Organs* and the *Voice* agree well, &c. But the *Virginals* and the *Lute*, or the *Welch-Harp* and *Irish-Harp*, or the *Voice* and *Pipes* alone, agree not so well ; but for the *Melioration* of *Musick*, there is yet much left (in this *Point of Exquisite Consorts*) to try & enquire

279.

There is a common observation, that if a *Lute* or *Vial* be laid upon the back with a small straw upon one side of the *strings*, and another *Lute* or *Vial* be laid by it, and in the other *Lute* or *Vial* the *Unison* to that *string* be stricken, it will make the *string* move ; which will appear both to the *Eye*, and by the *straws* falling off. The like will be if the *Diapason* or *Eight* to that *string* be stricken, either in the same *Lute* or *Vial*, or in others lying by : But in none of these there is any report of *Sound* that can be discerned, but only *Motion*.

280.

It was devised, that a *Vial* should have a Lay of Wire-strings below, as close to the Belly as a *Lute*, and then the *Strings* of Cuts mounted upon a Bridge, as in ordinary *Vials*; to the end, that by this means, the upper *Strings* stricken, should make the lower resound by *Sympathy*, and so make the *Musick* the better; which, if it be to purpose, than *Sympathy* worketh as well by report of *Sound*, as by *Motion*. But this device, I conceive, to be of no use, because the upper *Strings* which are stopped in great variety, cannot maintain a *Diapason* or *Unison* with the lower, which are never stopped. But if it should be of use at all, it must be in *Instruments* which have no stops, as *Virginals* and *Harps*; wherein tryal may be made of two rows of *Strings*, distant the one from the other.

281.

The *Experiment* of *Sympathy* may be transferred (perhaps) from *Instruments* of *Strings*, to other *Instruments* of *Sound*. As to try if there were in one Steeple two *Bells* of *Unison*, whether the striking of the one would move the other, more than if it were another accord: And so in *Pipes*: (if they be of equal bore and *Sound*) whether a little Straw or Feather would move in the one *Pipe*, when the other is blown at an *Unison*.

282.

It seemeth both in *Ear* and *Eye*, the *Instrument* of *Sense* hath a *Sympathy*, or Similitude with that which giveth the *Reflexion* (as hath been touched before.) For as the *sight* of the *Eye* is like a Chrystal, or Glass, or Water; so is the *Ear* a sinuous Cave with a hard Bone, to stop and reverberate the *Sound*: Which is like to the places that report *Eccho's*.

283.

Experiment
in Consort,
touching the
Hindring or
Helping of the
Hearing.

When a Man jawneth, he cannot hear so well. The cause is, for that the *Membrane* of the *Ear* is extended; and so rather casteth off the *Sound* than draweth it to.

284.

We hear better when we hold our *Breath*, than contrary, inasmuch, as in all listening to attain a *Sound* a far off, Men hold their *Breath*. The cause is, for that in all *Expiration* the motion is outwards, and therefore rather driveth away the voice than draweth it: And besides, we see that in all *Labor* to do things with any strength, we hold the *Breath*; and listening after any *Sound* that is heard with difficulty, is a kind of *Labour*.

285.

Let it be tryed, for the *Help* of the *Hearing*, (and I conceive it likely to succeed) to make an *Instrument* like a *Tunel*; the narrow part whereof may be of the bigness of the hole of the *Ear*; and the broader end much larger like a *Bell* at the skirts, and the length half a foot or more. And let the narrow end of it be set close to the *Ear*. And mark whether any *Sound* abroad in the open Air, will not be heard distinctly from further distance, than without that *Instrument*; being (as it were) an *Ear spectacle*. And I have heard there is in *Spain* an *Instrument* in use to be set to the *Ear* that helpeth somewhat those that are thick of *Hearing*.

286.

If the *Mouth* be shut close, nevertheless there is yielded by the *Roof* of the *Mouth*, a *Murmur*; such as is used by *Dumbmen*: But if the *Nostrils* be likewise stopped, no such *Murmur* can be made, except it be in the bottom of the *Pallate* towards the throat. Whereby it appeareth manifestly, that a *Sound* in the *Mouth*; except such as aforesaid, if the *Mouth* be stopped, passeth from the *Pallate* through the *Nostrils*.

287.

Experiments
in Consort,
touching the
Spiritual and
Fine Nature
of Sounds.

The *Repercussion* of *Sounds* (which we call *Eccho*) is a great argument of the *Spiritual Essence* of *Sounds*. For if it were *Corporeal*, the *Repercussion* should be created in the same manner, and by like *Instruments* with the

the *Original Sound*: But we see what a number of *Exquisite Instruments* must concur in speaking of words, whereof there is no such matter in the returning of them, but only a plain stop, and *repercussion*.

The exquisite *Differences of Articulate Sounds*, carried along in the *Air*, shew that they cannot be *Signatures* or *Impressions* in the *Air*, as hath been well refuted by the Antients. For it is true, that Seals make excellent Impressions, and so it may be thought of *Sounds* in their first generation: But then the *Delation* and *Continuance* of them, without any new sealing shew apparently they cannot be Impressions.

288.

All *Sounds* are suddenly made, and do suddenly perish; but neither that, nor the *exquisite Differences* of them, is matter of so great admiration: For the Quaverings, and Warblings in Lutes, and Pipes are as swift; and the Tongue (which is no very fine Instrument) doth in speech, make no fewer motions, than there be letters in all the words which are uttered. But that *Sounds* should not only be so speedily generated, but carried so far every way, in such a momentary time, deserveth more admiration. As for example, If a man stand in the middle of a Field, and speak aloud he shall be heard a Furlong in round, and that shall be in *articulate Sounds*, and those shall be entire in every little portion of *Air*; and this shall be done in the space of less than a minute.

289.

The *Sudden Generation* and *Perishing* of *Sounds*, must be one of these two ways: Either, that the *Air* suffereth some force by *Sound*, and then restoreth it self as Water doth; which being divided, maketh many circles, till it restore it self to the Natural consistence, or otherwise, that the *Air* doth willingly imbibe the *Sound* as grateful, but cannot maintain it; for that the *Air* hath (as it should seem) a secret and hidden appetite of receiving the *Sound* at the first; but then other gross and more materiate qualities of the *Air* straight ways suffocate it, like unto *Flame* which is generated with alacrity, but straight quenched by the enmity of the *Air*, or other Ambient Bodies.

290.

There be these *Differences* (in general) by which *Sounds* are divided:

1. *Musical, Immusical.*
2. *Treble, Base.*
3. *Flat, Sharp.*
4. *Soft, Loud.*
5. *Exterior, Interior.*
6. *Clean, Harsh, or Purling.*
7. *Articulate, Inarticulate.*

We have laboured (as may appear) in this *Inquisition of Sounds* diligently; both because *Sound* is one of the most hidden portions of *Nature* (as We said in the beginning) and because it is a *Vertue* may be called *Incorporeal* and *Immateriate*, whereof there be in *Nature* but few. Besides, we were willing (now in these our first *Centuries*) to make a pattern or president of an *Exact Inquisition* and we shall do the like hereafter in some other subjects which require it. For we desire that Men should learn and perceive how severe a thing the true *Inquisition of Nature* is; and should accustom themselves by the light of particulars, to enlarge their mindes to the amplitude of the World; and not to reduce the World to the narrowness of their Minds.

291.
Experiment
Solitary,
touching the
Orient Colours
in Dissolution
of Metals.

Metals give Orient and fine Colours in Dissolution : as Gold giveth an excellent Yellow, Quick-silver an excellent Green, Tin giveth an excellent Azure. Likewise in their Putrefactions, or Rusts as Vermilion, Verde-grease, Bise, Cirrus, &c. And likewise in their Vitrifications. The Cause is, for that by their strength of Body, they are able to endure the Fire, or Strong-waters, and to be put into an equal posture, and again, to retain part of their principal spirit: Which two things (equal posture, and quick Spirits) are required chiefly, to make Colours lightsome.

292.
Experiment
Solitary,
touching
Prolongation
of Life.

IT conduceth unto Long Life, and to the more placide Motion of the Spirits, which thereby do less prey and consume the Juyce of the Body: either that Mens actions be free and voluntary, that nothing be done *in vitâ minerva*, but *secundum genium*; or on the other side, that the Actions of Men be full of Regulation, and commands within themselves: For then the victory and performing of the command, giveth a good disposition to the Spirits, especially if there be a proceeding from degree to degree, for then the sense of victory is the greater. An example of the former of these, is in a Country life; and of the latter, in Monks and Philosophers and such as do continually enjoyn themselves.

292.
Experiment
Solitary,
touching
Appetite of
Union in
Bodies.

IT is certain, that in all Bodies, there is an Appetite of Union, and Evitation of Solution of Continuity, and of this Appetite there be many degrees, but the most remarkable, and fit to be distinguished, are three. The first in Liquors, the second in hard Bodies, and the third in Bodies cleaving or Tenacious. In Liquors this Appetite is weak; we see in Liquors, the Threding of them in Stillicides (as hath been said) the falling of them in Round Drops (which is the form of Union) and the staying of them for a little time in Bubbles and Froth. In the second degree or kind, this Appetite is strong; as in Iron, in Stone, in Wood, &c. In the third, this Appetite is in a Medium between the other two: For such Bodies do partly follow the touch of another Body, and partly stick and continue to themselves; and therefore they rope and draw themselves in threds, as we see in Pitch, Glem, Birdlime, &c. But note, that all solid Bodies are cleaving more or less; and that they love better the touch of somewhat that is Tangible, than of Air. For Water in small quantity cleaveth to any thing that is solid, and so would Metal too, if the weight drew it not off. And therefore Gold Foliate, or any Metal Foliate, cleaveth: But those Bodies which are noted to be clammy, and cleaving, are such as have a more indifferent Appetite (at once) to follow another Body, and to hold to themselves. And therefore they are commonly Bodies ill mixed, and which take more pleasure in a Foreign Body, than in preserving their own consistence and which have little predominance in Drought or Moisture.

294.
Experiment
Solitary,
touching the
like Operations
of Heat and
Time.

Time and Heat are fellows in many effects. Heat drieth Bodies that do easily expire; as Parchment, Leaves, Roots, Clay &c. And so doth Time or Age arefie; as in the same Bodies, &c. Heat dissolveth and melteth Bodies that keep in their Spirits, as in divers Liquefactions; and so doth Time in some Bodies of a softer consistence: As is manifest in Honey, which by Age waxeth more liquid, and the like in Sugar; and so in old Oyl, which is ever more clear and more hot in medicinale use. Heat causeth the Spirits to search some issue out of the Body, as in the Volatility of

of *Metals*; and so doth *Time*, as in the *Rust* of *Metals*. But generally *Heat* doth that in small time, which *Age* doth in long.

Some things which pass the *Fire*, are softest at first, and by *Time* grow hard, as the Crum of Bread. Some are harder when they come from the *Fire*, and afterwards give again, and grow soft as the Crust of Bread, Bisket, Sweet-Meats, Salt &c. The cause is, for that in those things which wax hard with *Time*, the work of the *Fire* is a kind of *melting*; and in those that wax soft with *Time*, (contrariwise) the work of the *Fire* is a kind of *Baking*; and whatsoever the *Fire* baketh, *Time* doth in some degree dissolve.

295.
Experiment
Solitary
touching the
Differing Ope-
rations of Fire,
and Time.

Motions pass from one Man to another, not so much by exciting *Imagination* as by *Invitation*, especially if there be an *Aptness* or *Inclination* before. Therefore *Gaping* or *Tawning*, and *Stretching*, do pass from Man to Man; for that that causeth *Gaping* and *Stretching* is, when the *Spirits* are a little Heavy, by any *Vapour*, or the like. For then they strive (as it were) to wring out, and expel that which loadeth them. So Men drowzy and desirous to sleep; or before the fit of an *Ague*, do use to yawn and stretch, and do likewise yeild a *Voice* or *Sound*, which is an *Interjection* of *Expulsion*: So that if another be apt and prepared to do the like, he followeth by the sight of another. So the *Laughing* of another maketh to laugh.

296.
Experiment
Solitary,
touching
Motions by I-
mitation.

There be some known *Diseases* that are *Infectious*, and others that are not. Those that are *infectious*, are first, Such as are chiefly in the *Spirits*, and not so much in the *Humors*, and therefore pass easily from *Body* to *Body*; such are *Pestilences*, *Lippitudes*, and such like. Secondly such as *Taint* the *Breath*, which we see passeth manifestly from Man to Man, and not invisibly as the affects of the *Spirits* do; such are *Consumptions* of the *Lungs*, &c. Thirdly such as come forth to the *Skin*, and therefore taint the *Air*, or the *Body* adjacent; especially, if they consist in an *Unctuous* substance, not apt to dissipate; such are *Scabs*, and *Leprosie*. Fourthly, such as are meerly in the *Humors*, and not in the *Spirits*, *Breath*, or *Exhalations*: And therefore they never infect, but by *Touch* onely; and such a *Touch* also, as cometh within the *Epidermis*, as the venome of the *French Pox*, and the biting of a *Mad-Dog*.

297.
Experiment
Solitary-
touching In-
fectious dis-
eases.

Most *Powders* grow more close and coherent by *mixture* of *Water*, than by *mixture* of *Oyl*, though *Oyl* be the thicker *Body*; as *Meal* &c. The reason is the *Congruity* of *Bodies*, which if it be more, maketh a perfecter imbibition, and incorporation: which in most *Powders* is more between *them* and *Water*, than between *them* and *Oyl*: But *Painters* colours ground, and *Ashes*, do better incorporate with *Oyl*.

298.
Experiment
Solitary,
touching the
Incorporation
of Powders
and Liquors.

Much *Motion* and *Exercise* is good for some *Bodies*, and *sitting* and *Less motion*, for others. If the *Body* be hot, and void of superfluous *Moistures*, too much *Motion* hurteth; and it is an error in *Physitians*, to call too much upon *Exercise*. Likewise, Men ought to beware, that they use not *Exercise* and a *spare diet*, both; but if much *Exercise* then a *plentiful diet*; and if *sparing diet*, then little *Exercise*. The *Benefits* that come of *Exercise* are, First, that it sendeth *Nourishment* into the parts more forcibly. Secondly,

299.
Experiment
Solitary,
touching Ex-
ercise of the
Body.

Secondly, that it helpeth to Excern by *Sweat*, and so maketh the Parts assimilate the more perfectly. Thirdly, that it maketh the *Substance* of the *Body* more *Solid* and *Compact*; And so less apt to be Consumed and Depredated by the *Spirits*. The *Evils* that come of *Exercise*, are: First, that it maketh the *Spirits* more hot and Predatory. Secondly, that it doth abate or be likewise, and attenuate too much the Moisture of the *Body*. Thirdly, that it maketh too great *Concussion*, (especially if it be violent,) of the *Inward Parts*; which delight more in Rest. But generally *Exercise*, if it be much, is no friend to *Prolongation* of *Life*; Which is one Cause, why *Women* live longer than *Men*, because they stir less.

§ 00.
Experiment
Solitary,
touching
Meats that in-
duce Satiety.

Some *Food* we may use long, and much, without *Glutting*; As Bread, flesh that is not fat, or rank, &c. Some other, (though pleasant) *Glutted* sooner; As Sweet Meats, Fat Meats, &c. The Cause is, for that *Appetite* consisteth in the Emptiness of the Mouth of the Stomack; Or possessing it with somewhat that is *Astringent*; And therefore Cold and Dry. But things that are *Sweet* and *Fat*, are more Filling: And do swim and hang more about the Mouth of the Stomack; and go not down so speedily; And again turn sooner to *Choler*, which is hot, and ever abateth the Appetite. We see also that another Cause of *Satiety*, is an *Over-custome*, and of *Appetite* is *Novelty*: and therefore *Meats*, if the same be continually taken, induce *Loathing*. To give the Reason of the *Distaste* of *Satiety*, and of the *Pleasure* in *Novelty*; and to distinguish not onely in Meats and Drinks, but also in Motions, Loves, Company, Delights, Studies, what they be that *Custome* maketh more grateful; And what more tedious; were a large Field. But for *Meats*, the Cause is *Attraction*, which is quicker, and more excited towards that which is new, than towards that whereof there remaineth a Relish by former use. (And generally) it is a Rule, that whatsoever is somewhat ingrate, at first, is made Grateful by *Custome*; But whatsoever is too pleasing at first, groweth quickly to *satiety*.



NATURAL HISTORY;

Century. IV.



ACCeleration of *Time*, in *Works of Nature*, may well be esteemed *Inter Magnalia Natura*. And even in *Divine Miracles*, *Accelerating of the Time*, is next to the *Creating of the Matter*. We will now therefore proceed to the enquiry of it; and for *Acceleration of Germination*, we will refer it over unto the place, where we shall handle the Subject of *Plants*, generally; and will now begin with other *Accelerations*.

Experiments
in Confort
touching the
Clarification of
Liquors, and
the Accelerating
thereof.

Liquors are (many of them) at the first, thick and troubled; As *Must*, *Worts*, *Juices of Fruits*, or *Herbs* expressed, &c. And by *Time*, they settle, and clarify. But to make them clear, before the *Time*, is a great work; for it is a spur to *Nature*, and putteth her out of her pace And besides, it is of good use for making *Drinks*, and *Sauces*, Potable, and Serviceable, speedily. But to know the *Means of Accelerating Clarification*, we must first know the *Causes of Clarification*. The first *Cause* is, by the *Separation* of the grosser parts of the *Liquor*, from the *finer*. The second, by the *equal distribution* of the *Spirits* of the *Liquor*, with the *Tangible parts*; for that ever representeth Bodies clear and untroubled. The third, by the *refining the Spirit it self*, which thereby giveth to the *Liquor*, more splendor, and more lustre.

301.

First, For *Separation*: It is wrought by *weight*; as in the ordinary residence or settlement of *Liquors*. By *Heat*, by *Motion*, by *Precipitation*, or *Sublimation*, (that is, a calling of the several parts, either up or down, which is a kind of *Attraction*;) by *Adhesion*; as when a Body, more *Viscous*, is mingled and agitated with the *Liquor*; which viscous Body (afterwards

302.

wards severed) draweth with it the grosser parts of the *Liquor*: And lastly, by *Percolation* or *Passage*.

303.

Secondly, For the *Even Distribution* of the *Spirits*, it is wrought by gentle *heat*, and by *Agitation* of *Motion*; (for of *Time* we speak not, because it is that we would anticipate and represent:) And it is wrought also by *mixture* of some other *Body*, which hath a vertue to open the *Liquor*, and to make the *Spirits* the better pass thorow.

304.

Thirdly, For the *refining* of the *Spirits*, it is wrought likewise by *Heat*, by *Motion*, and by *Mixture* of some *Body*, which hath *Vertue* to *attenuate*. So therefore (having shewn the *causes*) for the *Accelerating* of *Clarification* ingeneral, and the *Enducing* of it; take these *Instances* and *Tryals*.

305.

It is in common practice, to draw *Wine* or *Beer*, from the *Lees*, (which we call *Racking*) whereby it will *clarifie* much the sooner: For the *Lees*, though they keep the *Drink* in heart, and make it lasting, yet withal they cast up some spissitude: and this *Instance* is to be referred to *Separation*.

306.

On the other side, it were good to try, what, the adding to the *Liquor*, more *Lees* than his own, will work; for though the *Lees* do make the *Liquor* turbide, yet they refine the *Spirits*. Take therefore a Vessel of *New Beer*, and take another Vessel of *New Beer*, and rack the one Vessel from the *Lees*, and pour the *Lees* of the racked Vessel into the unracked Vessel, and see the effect. This *Instance* is referred to the *Refining* of the *Spirits*.

307.

Take *New Beer* and put in some quantity of *Stale Beer* into it, and see whether it will not accelerate the *Clarification*, by opening the *Body* of the *Beer*, and cutting the grosser parts, whereby they may fall down into *Lees*. And this *Instance* again is referred to *Separation*.

308.

The longer *Molt*, or *Herbs*, or the like, are infused in *Liquor* the more thick and troubled the *Liquor* is; but the longer they be decocted in the *Liquor*, the clearer it is. The reason is plain, because in *Infusion*, the longer it is, the greater is the part of the gross body that goeth into the *Liquor*. But in *Decoction* though more goeth forth, yet it either purgeth at the top or settleth at the bottom. And therefore the most exact way to *clarifie* is, first, to *Infuse*, and then to take off the *Liquor* and *Decoct* it; as they do in *Beer*, which hath *Molt* first infused in the *Liquor*, and is afterwards boiled with the *Hop*. This also is referred to *Separation*.

309.

Take *hot Embers*, and put then about a Bottle filled with *New Beer*, almost to the very neck; let the Bottle be well stopped, lest it flie out. And continue it, renewing the *Embers* every day by the space of ten days, and then compare it with another Bottle of the same *Beer* set by. Take also *Lime* both *Quenched* and *unquenched*, and set the Bottles in them *ut supra*. This *Instance* is referred both to the *even Distribution*, and also to the *Refining* of the *Spirits* by *Heat*.

310.

Take Bottles and *Swing* them or *Carry* them in a *Wheel-Barrow* upon *rough Ground*, twice in a day: But then you may not fill the Bottles full, but leave some *Air*; for if the *Liquor* come close to the stopple, it cannot play nor flower: And when you have shaken them well either way, pour the *Drink* into another Bottle, stopped close after the usual manner: for if it stay with much *Air* in it, the *Drink* will pall, neither will it settle so perfectly in all the parts. Let it stand some Twenty four hours, then take it, and put it again into a Bottle with *Air*, *ut supra*; and thence into a Bottle stopped, *ut supra*; and so repeat the same operation for seven dayes. Note that in the emptying of one Bottle into another; you must do it swiftly, lest the *Drink* pall.

pall : it were good also to try it in a *Bottle* with a little Air below the Neck without emptying. This *Instance* is referred to the even *Distribution* and *Refining* of the *Spirits* by *Motion*.

As for *Percolation*, inward, and outward (which belongeth to *Separation*,) Tryal would be made of *Clarifying* by *Adhesion*, with Milk put into *New Beer*, and stirred with it : For it may be, that the grosser part of the *Beer* will cleave to the *Milk*; the doubt is, whether the *Milk*, will serve well again which is soon tried. And it is usual in *Clarifying Ippocrasse* to put in *Milk*, which after severeth and carrieth with it the grosser parts of the *Ippocrass*, as hath been said elsewhere. Also for the better *Clarification* by *Percolation*; when they Tun *New Beer*, they use to let it pass through a *Strainer*, and it is like the finer the *Strainer* is, the clearer it will be.

THe *Accelerating* of *Maturation*, we will now enquire of, and of *Maturation* it self, It is of three natures, the *Maturation* of *Fruits*, the *Maturation* of *Drinks*, and the *Maturation* of *Impossthumes* and *Ulcers*. This last we refer to another place, where we shall handle *Experiments Medicinal*. There be also other *Maturations*, as of *Metals*, &c. Whereof we will speak as occasion serveth. But we will begin with that of *Drinks*, because it hath such affinity with the *Clarification* of *Liquors*.

For the *Maturation* of *Drinks*, it is wrought by the *Congregation* of the *Spirits* together, whereby they digest more perfectly the grosser parts, and it is effected, partly by the same means that *Clarification* is (whereof we speak before :) But then note, that as extream *Clarification* doth spread the *Spirits* so smooth, as they become dull; and the *Drink* dead, which ought to have a *Flowring*. And therefore all your clear *Amber drink* is flat.

We see the degrees of *Maturation* of *Drinks*, in *Must* in *Wine*, as it is drunk, and in *Vinegar*. Whereof *Must* hath not the *Spirits* well congregated. *Wine* hath them well united, so as they make the parts somewhat more Oily. *Vinegar* hath them congregated, but more Jeune, and in smaller quantity; the greatest and finest Spirit and part being exhaled : For we see *Vinegar* is made by setting the Vessel of *Wine* against the hot Sun. And therefore *Vinegar* will not burn, for that much of the finer part is exhaled.

The *Refreshing* and *Quickning* of *Drink* palled or dead, is by *Enforcing* the *Motion* of the *Spirit*. So we see that open weather relaxeth the *Spirit*, and maketh it more livelier in *Motion*. We see also *Bottling* of *Beer* or *Ale*, while it is new and full of *Spirit* (so that it spirteth when the stopple is taken forth) maketh the *Drink* more quick and windy. A *Pan* of *Coals* in the *Cellar* doth likewise good, and maketh the *Drink* work again. *New Drink* put to *Drink* that is *Dead*, provoketh it to work again : Nay, which is more (as some affirm) *A Brewing* of *New Beer*, set by *Old Beer*, maketh, it work again : it were good also to enforce the *Spirits* by some *Mixture*, that may excite and quicken them, as by the putting into the *Bottles*, *Nitre*, *Chalk*, *Linne*, &c. We see *Cream* is *Matured*, and made to rise more speedily by putting in *cold Water*; which, as it seemeth, getteth down the *Whey*.

It is tryed, that the *Burying* of *Bottles* of *Drink* well stopped, either in *dry Earth*, a good depth; Or in the *bottome* of a *Well* within *Water*; And best of

311.

312.

Experiment in Consort touching *Maturation*, and the *Accelerating* thereof. And first touching the *Maturation* and *Quickning* of *drinks* and next touching the *Maturation* of *Fruits*,

313.

314.

315.

of all, the *hanging* of them in a deep Well somewhat above the Water, for some fortnights space, is an excellent means of making Drink fresh and quick, For the cold doth not cause any exhaling of the *Spirits* at all, as heat doth, though it rarifieth the rest that remain: But cold maketh the *Spirits* vigorous, and irritateth them, whereby they incorporate the parts of the *Liquor* perfectly.

316. As for the *Maturation* of Fruit, it is wrought by the calling forth of the *Spirits* of the Body outward, and so spreading them more smoothly, and likewise by digesting, in some degree, the grosser parts: And this is effected by Heat, Motion, Attraction, and by a Rudiment of Putrefaction: For the Inception of Putrefaction hath in it a *Maturation*.

317. There were taken Apples and laid in Straw, in Hay, in Flower, in Chalk, in Lime, covered over with Onions, covered over with Crabs, closed up in Wax, shut in a Box, &c. There was also an Apple hanged up in smoak. Of all which the Experiments sorted in this manner.

318. After a moneths space, the Apple, enclosed in Wax, was as Green and fresh as at the first putting in, and the Kernels continued White. The cause is, for that all exclusion of open Air, (which is ever predatory) maintaineth the Body in his first freshness and moisture; but the inconvenience is, that it tasteth a little of the Wax, which, I suppose, in a Pomegranate, or some such thick coated fruit, it would not do.

319. The Apple hanged in the smoak, turned like an old Mellow-Apple wrinkled, dry, soft, sweet yellow within. The cause is, for that such a degree of heat, which doth neither melt nor scorch (for we see that in a greater heat, a roast Apple softneth and melteth, and Pigs feet made of quarters of Wardens, scotch and have a skin of coal) doth Mellow, and not adure: The smoak also maketh the Apple (as it were) sprinkled with Soot, which helpeth to Mature. We see that in drying of Pears and Prunes, in the Oven, and removing of them often as they begin to sweat, there is a like operation: but that is with a far more intense degree of heat.

320. The Apples covered in the Lime and Ashes were well matured as appeared both in their yellowness and sweetness. The cause is, for that that Degree of Heat, which is in Lime and Ashes, (being a smothering heat) is of all the rest most proper; for it doth neither Liquefie nor Arefie, and that is true Maturation. Note, that the taste of those Apples was good, and therefore it is the Experiment fittest for use.

321. The Apples covered with Crabs and Onions, were likewise well Matured. The cause is not any heat, but for that the Crabs and the Onions draw fourth the *Spirits* of the Apple, and spread them equally thorowout the Body; which taketh away hardness. So we see one Apple ripeneth against another: And therefore in making of Cider, they turn the Apples first upon a heap; so one Cluster of Grapes that toucheth another whilest it groweth, ripeneth faster *Botrus contra Botrum citius maturescit*.

322. The Apples in Hay and the Straw, ripened apparently, though not so much as the other, but the Apple in the Straw more. The cause is, for that the Hay and Straw have a very low degree of Heat, but yet close and smothering, and which dryeth not.

322. The Apple in the close Box was ripened also. The cause is, for that all Air kept close, hath a degree of warmth as we see in Wool, Fur, Plush, &c.

Note,

Note, that all these were compared with another Apple of the same kind that lay of it selfe; and in comparison of that, were more sweet, and more yellow, and so appeared to be more ripe.

324.

Take an Apple, or Pear, or otherlike Fruit, and Roul it upon a Table hard: We see in common experience, that the Rouling doth soften and sweeten the Fruit presently, which is nothing but the smooth distribution of the Spirits into the parts; for the unequal distribution of the Spirits maketh the harrishness: But this hard Rouling is between Concoction and a simple Maturation; therefore, if you should Roul them but gently perhaps twice a day, and continue it some seven days, it is like they would Mature more finely, and like unto the Natural Maturation.

325.

Take an Apple, and cut out a piece of the top, and cover it, to see whether that Solution of Continuity will not hasten a Maturation. We see that where a Wasp, or a Fly, or a Worm, hath bitten in a Grape, or any Fruit it will sweeten hastily.

326.

Take an Apple &c. and prick it with a Pin full of Holes, not deep, and smear it a little with Sack, or Cinnamon Water, or Spirit of Wine, every day for ten days, to see if the Virtual Heat of the Wine or Strong-Waters, will not Mature it.

In these Tryals also, as was used in the first, set another of the same Fruit by, to compare them, and try them by their Yellowness, and by their Sweetness.

Experiments
Solitary,
touching the
Making of
Gold.

THe World hath been much abused by the opinion of Making of Gold. The Work it self, I judge to be possible: but the Means (hitherto propounded) to effect it. are in the Practice, full of Error and imposture; and in the Theory, full of unsound Imaginations. For to say that Nature hath an intention to make all Metals Gold; and that if she were delivered from Impediments, she would perform her own work; and that if the Crudities, Impurities, and Leprosies of Metals were cured, they would become Gold, and that a little Quantity of the Medicines in the work of Projection, will turn a Sea of the baser Metal into Gold by Multiplying. All these are but dreams, and so are many other Grounds of Alchymy. And to help the matter, the Alchymists call in likewise many vanities, out of Astrology, Natural Magick; Superstitious Interpretations of Scriptures, Auricular Traditions, Feigned Testimonies of Aneient Authors, and the like. It is true, on the other side they have brought to light not a few profitable Experiments, and thereby made the world some amends: But we, when we shall come to handle the Version and Transmutation of Bodies, and the Experiments concernig Metals and Minerals; will lay open the true Ways and Passages of Nature which may lead to this great effect. And we commend the wit of the Chineses, who despair of making of Gold, but are mad upon the making of Silver. For certain it is, that it is more difficult to make Gold (which is the most ponderous and materiate amongst Metals) of other Metals, less pondrous and less materiate, than (Via versa) to make Silver, of Lead, or Quick-silver; both which are more pondrous than Silver: So that they need rather a further degree of Fixation, than any Condensation. In the mean time, by occasion of handling the Axioms touching Maturation we will direct a Tryal touching the Maturing of Metals, and thereby turning some of them into Gold; for we conceive indeed, that a perfect good Concoction, or Digestion, or Maturation of some Metals will produce Gold. And here we call to mind, that we knew a Dutch-man that had wrought himself into the belief of a great

great person, by undertaking, that he could make *Gold*: VVhose discourse was, That *Gold* might be made; but that the *Alchymists* over-fired the work: For (he said) the *making* of *Gold* did require a very temperate *Heat*, as being in *Nature* a subterrany work, where little *Heat* cometh; but yet more to the *making* of *Gold*, than of any other *Metal*: And therefore, that he would do it with a great Lamp, that should carry a temperate and equal *Heat*, and that it was the work of many Moneths. The devise of the Lamp was folly, but the over-firing now used, and the equal *Heat* to be required, and the making it a work of some good time, are no ill discourses.

We resort therefore to our *Axioms* of *Maturation*, in effect touched before.

The first is, That there be *used* a *Temperate Heat*; for they are ever *Temperate Heats* that *Disgests*, and *Mature*; wherein we mean *Temperate*, according to the *Nature* of the *Subject*: For that may be *Temperate* to *Fruits* and *Liquors*, which will not work at all upon *Metals*.

The Second is, That the *Spirit* of the *Metal* be *quickned*, and the *Tangible Parts* *opened*: For without those two operations, the *Spirit* of the *Metal*, wrought upon, will not be able to digest the *Parts*.

The third is, That the *Spirits* do *spread themselves even*, and *move not sub-sultorily*, for that will make the parts close and pliant. And this requireth a *Heat* that doth not rise and fall, but continue as *equal* as may be.

The fourth is, That *No part* of the *Spirit* be *emitted* but *detained*: For if there be *Emission* of *Spirit*, the *Body* of the *Metal* will be hard and churlish. And this will be performed, partly by the temper of the *Fire*, and partly by the closeness of the *Vessel*.

The fifth is, That there be *choice made* of the *likeliest* and *best prepared* *Metal* for the *Verson*; for that will facilitate the *VVork*.

The sixth is, that you give time enough for the *VVork*, not to prolong hopes (as the *Alchymists* do,) but indeed to give *Nature* a convenient space to work in.

These principles are most certain and true, we will now derive a direction of *Tryal* out of them, which may (perhaps) by further *Meditation* be improved.

327.

Let there be a *small Furnace* made of a *Temperate Heat*; let the *Heat* be such as may keep the *Metal* *perpetually molten*, and no more; for that above all, importeth to the *Work*: For the *Material*, take *Silver*, which is the *Metal*, that in *Nature*, symbolizeth most with *Gold*; put in also, with the *Silver* a tenth part of *Quick-silver*, and a twelfth part of *Nitre* by weight: Both these to quicken and open the *Body* of the *Metal*: and so let the *VVork* be continued by the *space of six months*, at the least. I wish also, That there be at sometimes an *Injection* of some *Oyled Substance*; such as they use in the recovering of *Gold*, which by *vexing* with *Separations* hath been made churlish: And this is, to lay the parts more close and smooth, which is the main work. For *Gold* (as we see) is the closest (and therefore the heaviest) of *Metals*; and is likewise the most flexible and tensible. Note, that to think to make *Gold* of *Quick-silver*, because it is the heaviest, is a thing not to be hoped; for *Quick-silver* will not endure the man-
age of the *Fire*: Next to *Silver*, I think *Copper* were fittest to be the *Ma-
terial*.

Gold

Gold hath these Natures: Greatness of Weight, Closeness of Parts, Fixation, Pliantness or Softness, Immunity from Rust, Colour or Tincture of Yellow. Therefore the sure way (though most about) to make Gold, is to know the Causes of the several Natures before rehearsed, and the Axioms concerning the same. For if a Man can make a Metal that hath all these Properties, let Men disput, whether it be Gold, or no?

328.
Experiment
Solitary,
touching
Nature of
Gold.

THe Enducing and Accelerating of Putrefaction, is a subject of a very Universal Enquiry. For Corruption is a Reciprocal to Generation; and they two are as Natures to Terms or Boundaries, and the Guides to Life and Death; Putrefaction is the Work of the Spirits of Bodies, which ever are unquiet to Get forth, and Congregate with the Air, and to enjoy the Sun-beams. The Getting forth, or spreading of the spirits, which is a degree of Getting forth) have five differing Operations. If the Spirits be detained within the Body, and move more violently, there followeth Colliquation; as in Metals, &c. If more mildly, there followeth Digestion, or Maturation; as in Drinks and Fruits. If the Spirits be not merely detained, but Protrude a little, and that Motion be confused, and inordinate there followeth Putrefaction; which ever dissolveth the Consistence of the Body into much inequality; as in Flesh, Rotten Fruits, Shining Wood, &c, and also in the Rust of Metals. But if that Motion be in a certain order there followeth Vivification and Figuration; as both in Living Creatures bred of Putrefaction, and in Living Creatures perfect. But if the Spirits issue out of the Body, there followeth Desiccation, Induration, Consumption, &c. As in Brick, evaporation of Bodies Liquid, &c.

Experiment
in Consort
touching
Enducing and
Accelerating
of Putrefaction.

The Means to induce and accelerate Putrefaction, are, First, By adding some crude or Watry moisture; as in Wetting of any Flesh, Fruit, Wood, with Water, &c. For contrariwise, Unctuous and Oily Substances preserve.

319.

The second is, By Invitation or Excitation; as when a rotten Apple lieth close to another Apple that is sound; or when Dung (which is a substance already putrified) is added to other Bodies. And this is also notably seen in Church-yards, where they bury much; where the Earth will consume the Corps, in far shorter time than other earth will.

330.

The third is, By Closeness and Stopping, which detaineth the Spirits in Prison, more then they would, and thereby irritateth them to seek issue; as in Corn and Cloaths which wax musty; and therefore open Air (which they call Aer perstabilis) doth preserve: And this doth appear more evidently in Agues, which come (most of them) of obstructions and Penning Humours, which thereupon Putrefie.

331.

The fourth is, By Solution of Continuity; as we see an Apple will rot sooner, if it be cut or pierced, and so will Wood, &c. And so the flesh of Creatures alive, where they have received any wound.

332.

The fifth is, Either by the Exhaling, or by the driving back of the Principal Spirits, which preserve the consistence of the Body, so that when their Government is dissolved, every part returneth to his Nature, or Homogeny. And this appeareth in Urine and blood, when they cool and thereby break. It appeareth also in the Gangreen or Mortification of Flesh, either by Opiates, or by Intense Cold. I conceive also, the same effect

333.

is in *Pestilences*, for that the *malignity* of the infecting vapour, daunteth the *Principal Spirits*, and maketh them flie, and leave their *Regiment*; and then the *Humours*, *Flesh*, and *Secondary Spirits*, do dissolve, and break, as in an *Anarch*.

334. The sixth is, when a *Forreign Spirit*, *stronger and more eager than the Spirit of the Body*, entreth the *Body*, as in the stinging of the *Serpents*. this is the *Cause* (generally) that upon all *Poysons* followeth *swelling*; and we see *Swelling* followeth also, when the *Spirits* of the *Body* it self congregate too much; as upon *Blows* and *Bruises*, or when they are pent in too much, as in *Swelling* upon *Cold*. And we see also, that the *Spirits* coming of *Putrefaction* of *Humors* in *Agues*, &c. which may be counted as *Foreign Spirits*, though they be bred within the *Body*, do extinguish and suffocate the *Natural Spirits* and heat.

335. The seventh is, By such a *Weak degree of heat*, as setteth the *Spirits* in a little *Motion*, but is not able either to digest the parts, or to issue the *Spirits*, as is seen in flesh kept in a room that is not cool; whereas in a cool and wet Larder it will keep longer. And we see, that *Vivification* (whereof *Putrefaction* is the *Bastard Brother*) is effected by such soft heats; as the hatching of *Eggs*, the heat of the *Womb*, &c.

336. The eighth is, By the *Releasing of the Spirits* which before were close kept by the solidness of their coverture, and thereby their appetite of issuing checked; as in the *Artificial Rusts* induced by Stong waters in *Iron*, *Lead*, &c. And therefore *Wetting* halteth *Rust* or *Putrefaction* of any thing, because it softneth the *Crust* for the *Spirits* to come forth.

337. The ninth is by the *Enterchange of heat and cold*, or *wet and dry*; as we see in the *Mouldring* of earth in *Frosts*, and *Sun*; and in the more hasty rotting of *Wood*, that is sometimes wet, sometimes dry.

338. The tenth is, By *time*, and the *work*, and *procedure of the Spirits themselves*, which cannot keep their station; especially, if they be left to themselves, and there be not *Agitation* or *Local Motion*. As we see in *Corn* not stirred, and *Mens Bodies* not exercised.

339. All *Moulds* are inceptions of *Putrefaction*; as the *Moulds* of *Pyes* and *Flesh*, the *Moulds* of *Orenges* and *Lemmons*, which *Moulds* afterwards turn into *Worms*, or more odious *Putrefactions*: And therefore (commonly) prove to be of ill odor. And if the *Body* be liquid, and not apt to putrefie totally, it will cast up a *Mother* in the top, as the *Mothers* of *distilled waters*.

340. *Moss* is a kind of *Mould* of the *Earth* and *Trees*: But it may be better sorted as a *Rudiment of Germination*, to which we refer it.

Experiments
in Confort,
touching
Prohibiting
and prevent-
ing Putrefacti-
on.

IT is an *Enquiry* of excellent use to enquire of the *Means of Preventing* or *Staying Putrefaction*; for therein consisteth the *Means of Conservation* of *Bodies*: For *Bodies* have two kinds of *Dissolutions*, the one by *Consumption* and *Desiccation*, the other by *Putrefaction*. But as for the *Putrefactions* of the *Bodies* of *Men* and *Living Creatures* (as in *Agues*, *Worms*, *Consumptions* of the *Lungs*, *Imposthumes*, and *Ulcers*, both inwards and outwards) they are a great part of *Physick* and *Surgery*: And therefore we will reserve the *Enquiry* of them to the proper place, where we shall handle *Medicinal Experiments* of all sorts. Of the rest, which will now enter into an enquiry, wherein much light may be taken from that which hath been said of the *Means to Enduce* or *Accelerate Putrefaction*: For the removing that which caused *Putrefaction*, doth prevent and avoid *Putrefaction*.

The first Means of prohibiting or checking Putrefaction is cold; for so we see that Meat and Drink will last longer, unputrified, or unfowred, In Winter than in Summer: And we see that Flowers, and Fruits; put in conservatories of Snow, keep fresh. And this worketh by the Detention of the *Spirits*, and constipation of the *Tangible parts*.

The second is *Astriction*: For *Astriction* prohibiteth *Dissolution*; as we see (generally) in *Medicines*, whereof such as are *Astringents* do inhibit *Putrefaction*: And by the same reason of *Astringency*, some small quantity of Oyl of Vitriol, will keep fresh water long from putrifying. And this *Astriction* is in a substance that hath a *Virtual cold*, and it worketh (partly) by the same means that cold doth.

The third is, The excluding of the *Air*, and again, the exposing to the *Air*: For these contraries, (as it cometh often to pass) work the same effect, according to the nature of the Subject matter. So we see, that *Beer* or *Wine* in Bottles close stopped, last long; that the *Garners* under *Ground* keep *Corn* longer, than those above *Ground*; and that *Fruit* closed in *Wax*, keepeth fresh: And likewise, *Bodies* put in *Honey*, and *Flower*, keep more fresh: And *Liquors*, *Drinks*, and *Juyces*, with a little Oyl cast on the top, keep fresh. Contrariwise, we see that *Cloath* and *Apparel*, not aired, do breed *Moths* and *Mould*; and the Diversity is, that in *Bodies* that need *Detention of Spirits*, the *Exclusion of the Air* doth good; as in *Drinks*, and *Corn*: But in *Bodies* that need *Emission of Spirits*, to discharge some of the superfluous moisture, it doth hurt, for they require *airing*.

The fourth is *Motion*, and *stirring*; for *Putrefaction* asketh *Rest*: For the subtil *Motion* which *Putrefaction* requireth is disturbed by any *Agitation*, and all *Local Motion* keepeth *Bodies* integral, and their parts together: As we see, that turning over of *Corn* in a *Garner*, or Letting it run like an *Hour-Glass*, from an upper *Room* into a *Lower*, doth keep it sweet: And running *Waters* putrifie not; and in mens *Bodies* exercise hindreth *Putrefaction*; and contrariwise *Rest*, and want of *Motion* or stoppings (whereby the running of *Humors*, or the *Motion* of *Perspiration*, is stayed) further *Putrefaction*, as we partly touched a little before.

The fifth is, The *Breathing forth of the Adventitious Moisture* in *Bodies*, for as wetting doth hasten *Putrefaction*: so convenient drying (whereby the more *Radical Moisture* is onely kept in) putteth back *Putrefaction* So we see that *Herbs* and *Flowers*, if they be dried in the shade, or dried in the hot Sun, for a small time keep best. For the *Emission* of the loose and *adventitious Moisture*, doth betray the *Radical Moisture*, and carryeth it out for company.

The sixth is, The *strengthening of the Spirits of Bodies*; for as a *Great Heat* keepeth *Bodies* from *Putrefaction*; but a *tepid heat* enclineth them to *Putrefaction*: So a strong *Spirit* likewise preserveth, and a weak or faint *Spirit* disposeth to *corruption*. So we find, that *Salt-water* corrupteth not so soon as fresh; and salting of *Oysters*, and powdring of *Meat*, keepeth them from *Putrefaction*. It would be tryed also, whether *Chalk* put into *Water*, or *Drink*, doth not preserve it from *Putrefying*, or speedy *Souring*. So we see that *Strong-Beer* will last longer than small, and all things, that are hot and aromatical, do help to preserve *Liquors*, or *Powders*, &c. which they do as well by strengthening the *Spirits*, as by soaking out the loose *Moisture*.

341.

342.

343.

344.

345.

346.

347. The seventh is, *Separation of the cruder Parts*, and thereby *making the Body more equal*; for all unperfect mixture is apt to *Putrifie*, and Watry substances are more apt to *Putrifie*, than oyle. So we see distilled Waters will last longer than raw Waters, and things that have passed the Fire, do last longer than those that have not passed the Fire; as dried Pears, &c.

348. The eighth is, *The drawing forth continually of that part, where the Putrefaction beginneth*: Which is (commonly) *the loose and watry moisture*, not only for the reason before given, that it provoketh the radical moisture to come forth with it; but because being detained in the Body, the *Putrefaction* taking hold of it, infecteth the rest: As we see in the *Embalming of Dead Bodies*. And the same reason is, of *Preserving Herbs, or Fruits, or Flowers*, in Bran or Meal.

349. The ninth is, *The commixture of anything that is more oyle or sweet*: For such Bodies are least apt to *putrifie*, the Air working little upon them, and they not putrifying preserve the rest. And therefore we see Syrrups and Oyntments will last longer than Juices.

350. The tenth is, *The commixture of somewhat that is dry*; for *Putrefaction* beginneth first from the *Spirits*, and then from the *moisture*; and that that is dry, is unapt to putrifie. And therefore smoak preserveth flesh as we see in Bacon, and Neats-Tongues, and Martlemas-Beef, &c.

351. The opinion of some of the *Ancients*, That *blown Airs* do preserve Bodies longer than other *Airs*, seemeth to me probable; for that the *blown Airs*, being over-charged and compressed, will hardly receive the exhaling of any thing, but rather repulse it. It was tryed in a *blown Bladder*, whereinto flesh was put, and likewise a Flower, and it sorted not: For *dry Bladders* will not *blow*, and *new Bladders* rather further *Putrefaction*. The way were therefore, to blow strongly with a pair of Bellows, into a Hogthead, putting into the Hogthead (before) that which you would have preserved; and in the instant that you withdraw the Bellows, stop the hole close.

352.
Experiment
solitary,
touching
Wood *Shining*
in the dark.

THe Experiment of Wood that *shineth in the dark*, we have diligently driven and pursued: The rather, for that of all things that give light here below, it is the most durable, and hath least apparent motion. Fire and Flame are in continual expence; *sugar* shining onely while it is in scraping; and *Salt-water* while it is in dashing; *Glo-worms* have their shining while they live, or a little after; onely *Scales of Fishes* (putrified) seem to be of the same nature with *shining Wood*. And it is true, that all *Putrefaction* hath with it an inward motion, as well as *Fire* or *Light*. The tryal sorted thus.

1. The *shining* is in some pieces more *bright*, in some more *dim*: but the most *bright* of all doth not attain to the *light* of a *Glo-worm*.
2. The Woods that have been tryed to shine, are chiefly *Sallow* and *Willow*; also, the *Ash* and *Hassle*, it may be it holdeth in others.
3. Both, *Roots*, and *Bodies* do shine, but the *Roots* better.
4. The colour of the *shining part* by day-light, is in some pieces *White*, in some pieces inclining to red; which in the Country they call the *White* and *Red Carret*.
5. The part that shineth, is (for the most part) somewhat *soft*, and *moist* to feel to; but some was found to be *Firm* and *hard*; so as it might be figured into a *Cross*, or into *Beads*, &c. But you must not look to have an *Image*, or the like, in any thing that is *Lightsom*, for even a *Face* in *Iron* red hot, will

will not be seen, the light confounding the small differences of lightsome and darksome, which shew the figure. 6. There was the *shining part* pared off, till you came to that, that did not shine, but within two days the *Part contiguous* began also to shine, being laid abroad in the Dew; as it seemeth the putrefaction spreadeth. 7. There was other dead *Wood* of like kind was *Laid abroad*, which *shined* not at the first; but after a nights lying abroad, began to shine. 8. There was other *Wood* that did first shine, and being laid dry in the House within five or six days *Lost the shining*; and laid abroad again *recovered the shining*. 9. *Shining Woods* being laid in a *dry Room*, within a seven night lost their shining; but being laid in a *Cellar*, or *dark Room*, kept the shining. 10. The *Boring of holes* in that kinde of *Wood*, and then laying it abroad, seemeth to conduce to make it shine; the *cause* is, for that all *solution of continuity*, doth help on *putrefaction*, as was touched before. 11. No *Wood* hath been yet tryed to shine that was cut down alive, but such as was *rotted* both in *Stock* and *Root* while it grew. 12. Part of the *Wood*, that *shined*, was *steeped in Oyl* and retained the *shining* a fortnight. 13. The like succeeded in some *steeped in Water* and much better. 14. How long the *shining* will continue, if the *Wood* be *Laid abroad every night*, and *taken in* and *sprinkled with Water* in the day, is not yet tryed. 15. Tryal was made of *Laying it abroad in frosty weather*, which hurt it not. 16. There was a great piece of a *Root*, which did shine, and the *shining part* was cut off, till no more shined; yet after two nights, though it were kept in a *dry Room*, it got a *shining*.

THe *Bringing forth of Living Creatures* may be *Accelerated* in two respects: The one, if the *Embryon ripeneth* and perfecteth sooner; the other, if there be some cause from the *Mothers Body of Expulsion* or putting it down, Whereof the former is good and argueth strength, the latter is ill, and cometh by accident or disease. And therefore the *Ancient Observation* is true, that the *Child born in the seventh month*, doth commonly well; but *Born in the Eighth Month*, doth (for the most part) die. But the *cause* assigned is fabulous, which is, That in the Eighth Moneth should be the turn of the reign of the Planet Saturn, which (as they say) is a Planet malign; whereas in the Seventh is the reign of the Moon, which is a Planet propitious. But the true *cause* is, for that where there is so great a prevention of the ordinary time, it is the *Lustiness* of the *Child*, but when it is less, it is some *indisposition* of the *Mother*.

TO *Accelerate Growth or Stature*, it must proceed, either from the *Plenty* of the *Nourishment*, or, from the *Nature* of the *Nourishment*, or from the *Quickning and Exciting* of the *Natural heat*. For the first *Excess* of *Nurishment*, is hurtful; for it maketh the *Child* corpulent, and growing in bredth, rather than in height. And you may take an Experiment from *Plants*, which if they spread much, are seldome tall. As for the *Nature* of the *Nourishment*; First, it may not be too dry, and therefore *Children* in *Dairy Countreyes* do wax more tall, than where they feed more upon *Bread and Flesh*. There its also a received tale, that boyling of *Dasie-Roots* in *Milk* (which it is certain are great dryers) will make *Dogs* little. But so much is true, That an *over-dry Nourishment*, in *Childhood* putteth back *Stature*. Secondly, The *Nourishment* must be of an opening

353.
Experiment
Solitary
touching the
Acceleration
of Birth.

354.
Experiment
Solitary
touching the
Acceleration
of Growth and
Stature.

Nature; for that attenuateth the Juyce, and furthereth the Motion of the Spirits upwards. Neither is it without cause, that *Xenophon* in the *Nourture* of the *Persian Children*, doth so much commend their feeding upon *Cardamon*, which (he saith) made them grow better, and be of a more active habit. *Cardamon* is in Latin, *Nasturtium*, and with us *Water-creffes*; which it is certain, is an Herb, that whilst it is young, is friendly to Life. As for the *Quickning* of *Natural Heat* it must be done chiefly with *exercise*; and therefore (no doubt) much going to School, where they sit so much, hindreth the *Growth* of *Children*; whereas Country-People, that go not to School, are commonly of better stature. And again, Men must beware how they give *Children* any thing that is cold in operation; for even *Long sucking* doth hinder both Wit and Stature. This hath been tryed, that a Whelp that hath been fed with *Nitre* in Milk, hath become very little, but extream lively: For the Spirit of *Nitre* is cold. And though it be an excellent Medicine in strength of years for Prolongation of Life; yet it is in Children and young Creatures an enemy to growth; and all for the same reason, For *Heat* is requisite to Growth. But after a man is come to his middle age, *Heat* consumeth the Spirits; which the coldness of the Spirit of *Nitre* doth help to condense and correct.

Experiments
in Confort
touching
Sulphure and
Mercury. two
of Paracelsus
Principles.

There be two Great Families of Things, you may term them by several names, *Sulphureous* and *Mercurial*, which are the *Chymists* words: (For as for their *Sal* which is their third Principle, it is a Compound of the other Two) *Inflamable*, and *Not Inflamable*; *Mature* and *Crude*, *Oyl* and *Watry*: For we see that in *Subterraneities* there are, as the *Fathers* of their Tribes *Brimstone* and *Mercury*; In *Vegetables* and *Living Creatures*, there is *Water* and *Oyl*; in the *Inferior order* of *Pneumatics*, there is *Air* and *Flame*; and in the *Superior*, there is the *Body* of the *Star*, and the *Pure Sky*. And these Pairs, though they be unlike in the Primitive Differences of Matter, yet they seem to have many consents; for *Mercury* and *Sulphure* are principles Materials of *Metals*; *Water* and *Oyl* are principal Materials of *Vegetables* and *Animals*, and seem to differ but in *Maturation* or *Concoction*. *Flame* (in *Vulgar Opinion*) is but *Air incensed*, and they both have quickness of Motion, and facility of Cession, much alike. And the *Interstellar Sky*. (though the opinion be vain, that the *Star* is the *Denser Part* of his *Orb*,) hath notwithstanding so much affinity with the *Star*, that there is a rotation of that, as well as of the *Star*. Therefore, it is one of the geatest *Magnalia Nature*, to turn *Water* or *Watry Juyce* into *Oyl* or *Oily Juyce*: Greater in Nature, than to turn *Silver* or *Quick-silver* into *Gold*.

355. The Instances we have wherein *Crude* and *Watry* substance, turneth into *Fat* and *Oily*, are of four kinds. First, in the *Mixture* of *Earth* and *Water*, which mingled by the help of the Sun, gather a *Nitrous Fatness* more than either of them have severally; As we see, in that they put forth *Plants*, which need both Juyces.

356. The second is in the *Assimilation* of *nourishment*, made in the *Bodies* of *Plants*, and *Living Creatures*; whereof *Plants* turn the Juyce of meer *Water* and *Earth*, into a great deal of *Oily matter*: *Living Creatures*, though much of their *Fat*, and *Flesh*, are out of *Oily Aliments*, (as *Meat*, and *Bread*) yet they assimilate also in a measure their *Drink* of *Water*, &c.

&c. But these two ways of *Version* of *Water* into *Oyl*, (namely, by *Mixture* and by *Assimilation*) are by many *Passages*, and *Percolations*, and by long continuance of soft *Heats*, and by circuits of time.

The third is in the *Inception* of *Putrefaction*; as in *Water corrupted*, and the *Mothers* of *Waters distilled*, both which have a kind of *Fatness* or *Oyl*.

The fourth is in the *Dulceration* of some *Metals* as *Saccharum Saturni*, &c.

The Intension of *Version* of *Water* into a more *Oily substance* is by *Digestion*: For *Oyl* is almost nothing else but *Water Digested*, and this *Digestion* is principally by *Heat*: which *Heat* must be either *outward* or *inward*. Again, It may be by *Provocation* or *Excitation*, which is caused by the mingling of *Bodies* already *oily* or *digested*, for they will somewhat communicate their *Nature* with the rest. *Digestion* also is strongly effected by direct *Assimilation* of *Bodies Crude* into *Bodies Digested*; as in *Plants* and *Living Creatures*, whose nourishment is far more *Crude* than their *Bodies*. But this *Digestion* is by a great compass as hath been said. As for the more full handling of these two principles, whereof this is but a taste; (the enquiry of which, is one of the profoundest enquiries of *Nature*;) we leave it to the *Title* of *Version of Bodies*; and likewise to the *Title* of the *First Congregations* of *Matter*, which like a *General Assembly* of *Estates*, doth give *Law* to all *Bodies*.

A *Chamelion* is a *Creature* about the bigness of an ordinary *Lizard*, his *Head* unproportionably big, his *eyes* great; he moveth his *Head* without the writhing of his *Neck* (which is inflexible) as a *Hog* doth: His *Back* crooked, his *Skin* spotted with little *Tumors*, less eminent nearer the *Belly*; his *Tail* slender and long; on each *Foot* he hath five *Fingers*; three on the outside, and two on the inside; his *Tongue* of a marvellous length, in respect of his *Body*, and hallow at the end, which he will lanch out to prey upon *Flies*. Of colour *Green*, and of a dusky *Yellow*, brighter and whiter toward the *Belly*, yet spotted with *Blew*, *White*, and *Red*. If he be laid upon *Green*, the *Green* predominateth, if upon *Yellow*, the *Yellow*; not so if he be laid upon *Blew*, or *Red*, or *White*, onely the *Green* spots receive a more orient lustre; laid upon *Black*, he looketh all *Black*, though not without a mixture of *Green*. He feedeth not onely upon *Air*, (though that be his principal sustenance;) for sometimes he taketh *Flies*, as was said; yet some that have kept *Chamelions* a whole year together, could never perceive that ever they fed upon any thing else but *Air*, and might observe their *Bellies* to swell after they had exhausted the *Air*, and closed their *Jaws*, which they open commonly against the *Rayes* of the *Sun*. They have a foolish *Tradition* in *Magick*, that if a *Chamelion* be burnt upon the top of an *House*, it will raise a *Tempest*, supposing (according to their vain *Dreams* of *Sympathies*) because he nourisheth with *Air*, his *Body* should have great vertue to make impression upon the *Air*.

It is reported by one of the *Ancients*, that in part of *Media* there are *Eruptions* of *Flames* out of *Plains*, and that those *Flames* are clear, and cast not forth such smoak, and ashes, and pumice, as *Mountain Flames*, doth; The reason (no doubt) is, because the *Flame* is not pent, as it is in *Mountains*, and *Earthquakes* which cast *Flame*. There be also some *blinde Fires*, under

357.

358.

359.

360.
Experimente
Solitary,
touching
Chamelions.

361.
Experiments
Solitary,
touching
Subterrany
Fires.

under *Stones*, which flame not out, but *Oyl* being poured upon them, they flame out. The cause thereof is, for that it seemeth the *Fire* is so choaked, as not able to remove the *Stone*, it is *Heat* rather than *Flame*, which nevertheless is sufficient to enflame the *Oyl*.

362.
Experiment
Solitary,
touching
Nitre.

IT is reported, that, in some *Lakes* the *Water* is so *Nitrous* as if foul *Cloaths* be put into it, it scoureth them of it self: And if they stay any whit long they moulder away, And the scouring Virtue of *Nitre* is the more to be noted, because it is a *Body cold*; and we see *Warm Water* scoureth better than *cold*. But the cause is, for that it hath a subtil Spirit, which severeth and divideth any thing that is foul, and viscous, and sticketh upon a *Body*.

263.
Experiment
Solitary,
touching
Congealing of
Air.

TAke a *Bladder*, the greatest you can get; fill it full of *Wind*, and tye it about the Neck with a *Silk* threed waxed: and upon that likewise *Wax* very close; so that when the Neck of the *Bladder* drieth no *Air* may possibly get in nor out; Then bury it three or four foot under the *Earth* in a *Vault*, or in a *Conservatory* of *Snow*, the *Snow* being made hollow about the *Bladder*; and after some fortnights distance, see whether the *Bladder* be shrunk: For if it be, than it is plain, that the coldness of the *Earth* or *Snow*, hath condensed the *Air* and brought it a degree nearer to *Water*: Which is an *Experiment* of great consequence.

364.
Experiment
Solitary,
touching
Congealing of
Water into
Chrystal.

IT is a report of some good credit, that in *Deep Caves* there are *Pensile Chrystal*, and degrees of *Chrystal* that drop from above, and in some other (though more rarely) that rise from below. Which though it be chiefly the work of cold, yet it may be that *Water* that passeth thorow the *Earth* gathereth a Nature more clammy, and fitter to congeal, and become solide than *Water* of it self. Therefore tryal would be made to lay a heap of *Earth* in great *Frosts*, upon a hollow *Vessel* putting a *Canvase* between, that it falleth not in; and pour *Water* upon it, in such quantity as will be sure to soak thorow, and see whether it will not make an harder *Ice* in the bottom of the *Vessel*, and less apt to dissolve than ordinarily. I suppose also that if you make the *Earth* narrower at the bottom than at the top, in fashion of a *Sugar Loaf* reversed it will help the *Experiment*. For it will make the *Ice*, where it issueth, less in bulk; and evermore smallness of quantity is a help to *Version*.

365.
Experiments
in Consort,
touching
Preserving of
Rose Leaves,
both in Colour
and Smell.

TAke *Damask Roses* and pull them, then dry them upon the top of an *House*, upon a *Lead* or *Tarras* in the hot *Sun*, in a clear day, between the hours (onely) of *Twelve* and two or thereabouts. Then put them into a sweet dry *Earthen Bottle* or a *Glass* with narrow mouths, stuffing them close together, but without bruising: Stop the *Bottle* or *Glass* close, and these *Roses* will retain, not onely their smell perfect, but their colour fresh for a year at least. Note that nothing doth so much destroy any *Plant*, or other *Body*, either by *Putrefaction*, or *Arefaction*, as the *Adventitious Moisture*, which hangeth loose in the *Body*, if it be not drawn out. For it betrayeth and tolleth forth the *Innate* and *Radical Moisture* along with it when it self goeth forth. And therefore in *Living Creatures*, moderate sweat doth preserve the *Juyce* of the *Body*. Note, that these *Roses* when you take them from the drying have little
or

or no Smell; So that the Smell is a Second Smell, that issueth out of the Flower afterwards.

THe Continuance of Flame, according unto the diversity of the Body Enflamed, and other Circumstances, is worthy the Enquiry; Chiefly, for that though Flame be (almost) of Momentary lasting, yet it recieveth the More, and the Less: we will first therefore speak (at large) of Bodies Enflamed, wholly, and Immediate, without any Wick to help the Inflammation. A Spoonful of Spirit of VVine, a little heated, was taken, and it burnt as long as came to 116. Pulses. The same Quantity of Spirit of VVine, Mixed with the Sixth Part of a Spoonful of Nitre, burnt but to the space of 94. Pulses. Mixed with the like Quantity of Bay-salt, 83. Pulses. Mixed with the like Quantity of Gunpowder, which dissolved into a Black-water, 110. Pulses. A Cube, or Pellet of Yellow VVax, was taken, as much as half the Spirit of VVine, and set in the Middest, and it burnt onely to the space of 87. Pulses. Mixed with the Sixth Part of a Spoonful of Milk it burnt to the space of 100. Pulses; And the Milk was crudled. Mixed with the Sixth Part of a spoonful of VVater, it burnt to the space of 86. Pulses. With an Equal Quantity of VVater, onely to the space of 4. Pulses. A small Pebble was laid in the Midst, and the Spirit of VVine burnt to the space of 94. Pulses. A piece of Wood, of the Ligness of an Arrow, and about a Fingers length, was set up in the Midst, and the Spirit of VVine burnt to the space of 94. Pulses. So that the Spirit of Wine Simple, indured the longest; And the Spirit of Wine with the Bay-salt, and the Equal Quantity of Water were the shortest.

Consider well, whether the more speedy Going forth of the flame, be caused by the Greater Vigour of the Burning; Or by the Resistance of the Body mixed, and the Aversion thereof to take Flame: Which will appear by the Quantity of the Spirit of Wine, that remaineth after the Going out of the Flame. And it seemeth clearly to be the latter; For that the Mixture of Things least apt to burn, is the speediest in going out. And note, by the way, that Spirit of Wine burned, till it go out of it self will burn no more; and tasteth nothing so hot in the Mouth, as it did; No nor yet sower, (as if it were a degree towards Vineger) which Burnt Wine doth; but flat, and dead.

Note, that in the Experiment of Wax aforesaid, the Wax dissolved in the burning, and yet did not incorporate it self, with the Spirit of Wine, to produce one Flame; but wheresoever the Wax floated the Flame forsook it, till at last it spread all over, and put the Flame quite out.

The Experiments of the Mixtures of the Spirit of VVine enflamed, are Things of discovery, and not use: But now we will speak of the Continuance of Flames, such as are used for Candles, Lamps, or Tapers; consisting of Inflammable matters, and of a Wick that provoketh Inflammation. And this importeth not only discovery, but also use and Profit; For it is great Saving in all such Lights, if they can be made as fair and bright as others, and yet last longer. Wax pure made into a Candle, and VVax mixed severally into Candle stuffe, with the particulars that follow; (viz. VVater, Aqua-vita, Milk, Bay-salt, Oyl, Butter, Nitre, Brimstone, Sawdust,) Every of these bearing a Sixth part to the VVax; And every of these Candles mixed, being of the same VVeight and Wick with the Wax Pure, proved thus in the burning and lasting. The swiftest in Consuming was that with Sawdust; which first burned fair, till some part of the Candle was consumed, and

366.
Experiment
in Confort,
touching the
Continuance of
Flame.

367.

368.

369.

and the dust gathered about the snafte; but then it made the snafte big, and long, and to burn dusky, and the *Candle* wasted in half the time of the *Wax* pure. The next in swiftness, were the *Oyl* and *Butter*, which consumed by a fifth part swifter than the pure *Wax*. Then followed in swiftness the *clear Wax* it self; then the *Bay-salt*, which lasted about an eighth part longer than the *clear Wax*; then followed the *Aqua vite*, which lasted about a fifth part longer than the *clear Wax*; then follow the *Milk* and *Water*, with little difference from the *Aqua vite*, but the *Water* slowest. And in these four last, the *Wick* would spit fourth little sparks: For the *Nitre*, it would not hold lighted above some twelve Pulses: But all the while it would spit out portions of *Flame*, which afterwards would go out into a vapor. For the *Brimstone*, it would hold lighted much about the same with the *Nitre*; but then after a little while, it would harden and cake about the snafte: So that the mixture of *Bay-salt* with *Wax*, will win an eighth part of the time of lasting, and the *Water* a fifth.

370.

After the several *materials* were tryed, Tryal was likewise made of several *Wicks*; as of ordinary *Cotten*, *Sowing Thred*, *Rush*, *Silk*, *Straw*, and *Wood*. The *Silk*, *Straw*, and *Wood*, would flame a little, till they came to the *Wax*, and then go out: of the other three, the *Thred* consumed faster than the *Cotten*, by a sixth part of time, the *Cotten* next; then the *Rush* consumed slower than the *Cotten*, by at least a third part of time. For the bigness of the *Flame*, the *Cotten*, and *Thred*, cast a *Flame* much alike, and the *Rush* much less and dimmer. Quere, whether *Wood* and *Wicks* both, as in *Torches* consume faster, than the *Wicks* Simple?

371.

We have spoken of the several *Materials*, and the several *Wicks*; but to the lasting of the *Flame*, it importeth also, not onely, what the *material* is, but in the same *material*, whether it be hard, soft, old, new, &c. Good *Houſwives* to make their *Candles* burn the longer, use to lay them (one by one) in *Bran* or *Flower*, which make them harder, and so they consume the slower. Infomuch, as by this means they will out-last other *Candles* of the same stuff, almost half in half. For *Bran* or *Flower* have a Vertue to harden, so that both age, and lying in the *Bran* doth help to the lasting. And we see that *Wax* *Candles* last longer then *Tallow* *Candles*, because *Wax* is more firm and hard.

372.

The Lasting of *Flame* also dependeth upon the ease drawing of the *Nourishment*; as we see in the *Court of England*, there is a service which they call *All Night*, which is (as it were) a great Cake of *Wax*, with the *Wick* in the midst, whereby it cometh to pass, that the *Wick* fetcheth the *Nourishment* further off. We see also, that *Lamps* last longer: because the *Vessel* is far broader than the breadth of a *Taper* or *Candle*.

373.

Take a *Turreted Lamp* of *Tin* made in the form of a *Square*; the height of the *Turret*, being thrice as much as the length of the lower, part whereupon the *Lamp* standeth; make onely one hole in it, at the end of the return furthest from the *Turret*. Reverse it, and fill it full of *Oyl*, by that hole; and then set it upright again, and put a *Wick* in at the hole, and lighten it. You shall find that it will burn slow, and a long time: Which is caused (as was said last before) for that the *Flame* fetcheth the *Nourishment* afar off. You shall find also, that as the *Oyl* waiteth and descendeth, so the top of the *Turret*, by little and little filleth with *Air*; which is caused by the Rarefaction of the *Oyl* by the heat. It were worthy the observation to make a hole, in the top of the *Turret*, and to try, when the

the Oyl is almost consumed; whether the Air made of the Oyl, if you put to it a Flame of a Candle, in the letting of it forth, will enflame. It were good also to have the Lamp made, not of Tin, but of Glass; that you may see how the Vapor or Air gathereth by degrees in the top.

A fourth point, that importeth the *Lasting* of the Flame, is the *close-ness* of the Air, wherein the Flame burneth. We see, that if Wind bloweth upon a Candle, it wasteth a pace; we see also it lasteth longer in a *Lanthorn*, than at Large. And there are Traditions of Lamps and Candles, that have burnt a very long time, in *Caves*, and *Tombs*.

A fifth point, that importeth the *Lasting* of the Flame, is the *Nature* of the Air where the Flame burneth; whether is be hot or cold, moist or dry. The Air, if it be very Cold, irritateth the Flame, and maketh it burn more fiercely, (as Fire scorcheth in Frosty weather) and so furthereth the *Consumption*. The Air once heated, (I conceive) maketh the Flame burn more mildly, and so helpeth the *Continuance*. The Air, if it be Dry, is indifferent; the Air, if it be *moist*, doth in a degree quench the Flame, (as we see Lights will go out in the Damps of Mines;) and howsoever maketh it burn more dully, and so helpeth the *Continuance*.

374.

375.

376.

Experiments
in Confort,
touching
Burials or In-
fusions of di-
vers Bodies in
Earth.

Burials in Earth serve for *Preservation*, and for *Condensation*, and for *Induration* of Bodies. And if you intend *Condensation* or *Induration*, you may bury the Bodies so, as Earth may touch them; as if you would make *Artificial Procellane*, &c. And the like you may do for *Conservation*, if the Bodies be hard and solid, as Clay. Wood, &c. But if you intend *Preservation* of Bodies, more soft and tender, then you must do one of these two: Either you put mult them in cases, whereby they may not touch the Earth; or else you must *Vault* the Earth, whereby it may hang over them, and not touch them: For if the Earth touch them it will do more hurt by the moisture, causing them to putrifie, than good by the Virtual cold, to conserve them, except the Earth be very dry and sandy.

An Orange, Lemmon, and Apple, wrapt in a Linnen Cloth, being buried for a fortnights space four foot deep within the Earth, though it were in a moist place, and a rainy time; yet came forth no ways mouldy or rotten, but were become a little harder than they were, otherwise fresh in their colour, but their Juyce somewhat flatted. But with the *Burial* of a fortnight more, they became putrified.

377.

378.

A Bottle of Beer, buried in like manner as before, became more lively, better tasted, and clearer than it was: And a Bottle of Wine, in like manner. A Bottle of Vinegar so buried, came forth more lively and more odoriferous, smelling almost like a Violet. And after the whole Moneths *Burial*, all the three came forth as fresh and lively, if not better than before.

379.

It were a profitable *Experiment*, to preserve Oranges, Lemmons, and Pomgranates, till Summer; for then their price will be mightily encreased. This may be done, if you put them in a Pot or Vessel well covered, that the *moisture* of the Earth come not at them; or else by putting them in a *Conservatory* of Snow. And generally, whosoever will make *Experiments* of Cold, let him be provided of three things, a *Conservatory* of Snow, a good large *Vault*, twenty foot at least under the Ground, and a deep well.

There

There hath been a tradition, that *Pearl*, and *Coral*, *Turchois-Stone*, that have lost their Colours, may be recovered by *Burying* in the *Earth*; which is a thing of great profit, if it would sort: But upon tryal of six weeks *Burial*, there followed no effect. It were good to try it in a *deep Well*, or in a *Conservatory of Snow*, where the cold may be more constringent; and so make the *Body* more united, and thereby more resplendent.

381.

Experiment
Solitary,
touching the
Effects in
mens Bodies
from several
Winds

Mens Bodies are heavier and less disposed to Motion When *Southern Winds* blow, then when *Northern*. The cause is, for that when the *Southern Winds* blow, the *Humors* do (in some degree) melt, and wax fluide, and so flow into the parts; as it is seen in *Wood*, and other *Bodies*, which when the *Southern Winds* blow, do swell. Besides the Motion and Activity of the *Body* consisteth chiefly in the sinews, which, when the *Southern Winds* blow, are more relax.

382.

Experiment
Solitary,
touching
Winter and
Summers Sick-
nesses.

IT is commonly seen, that more are sick in the *Summer*, and more dye in the *Winter*; except it be in *Pestilent Diseases*, which commonly reign in *Summer* or *Autumn*. The reason is, because *Diseases* are bred (indeed) chiefly by *Heat*; but then they are cured most by *Sweat* and *Purge*, which in the *Summer* cometh on, or is provoked more easily: As for *Pestilent diseases*, the reason why most dye of them in *Summer*, is because they are bred most in the *Summer*; for otherwise, those that are touched are in most danger in the *Winter*.

383.

Experiment
Solitary,
touching
Pestilential
Seasons.

THe general opinion is, That *Tears* hot and moist, are most *Pestilential* upon the superficial Ground; that *Heat* and *Moisture* cause *Putrefaction*. In *England* it is found not true; for many times, there have been great *Plagues* in dry years. Whereof the cause may be, for that drought in the *Bodies* of *Islanders*, habituate to moist *Airs*, doth exasperate the *Humors*, and make them more apt to putrefie or Enflame; besides it tainteth the *Waters* (commonly) and maketh them less wholesome. And again in *Barbary*, the *Plagues* break up in the *Summer Months*, when the *Weather* is hot and dry.

384.

Experiment
Solitary
touching An
Error received
about Epide-
mical diseases.

MAny *Diseases*, (both *Epidemical* and others) break forth at particular times. And the cause is falsely imputed to the constitution of the *Air* at that time, when they break forth or reign; whereas it proceedeth (indeed) from a *Precedent Sequence*, and *Series* of the *Seasons* of the *Year*: And therefore *Hippocrates* in his *Prognosticks*, doth make good observations of the *Diseases*, that ensue upon the Nature of the precedent four seasons of the *Year*.

385.

Experiments
in Consort
touching
Alteration or
Preservation
of Liquors in
Wells or deep
Vaults.

TRyal hath been made with *Earthen Bottles*, well stopped, hanged in a *Well* of Twenty Fathom deep, at the least; and some of the *Bottles* have been let down into the *Waters*; some others have hanged above within about a Fathom of the *Water*; and the *Liquors* so tryed have been, *Beer*, (not new, but ready for drinking) and *Wine*, and *Milk*. The proof hath been, that both the *Beer*, and the *Wine*, (as well within *Water*, as above) have not been palled or deaded at all; but as good, or somewhat better than *Bottles* of the same *Drinks* and staleness, kept in a *Cellar*. But those which did hang above *Water*, were apparently the best; and that *Beer* did flower

flower, a little; whereas that under *Water* did not, though it were fresh. The *Milk* scoured, and began to putrifie. Nevertheless it is true, that there is a *Village* near *Blois*, wherein deep *Caves* they do thicken *Milk*, in such sort, that it becometh very pleasant; which was some *cause* of this tryal of hanging *Milk* in the *Well*: But our proof was naught, neither do I know whether that *Milk* in those *Caves* be first boyled. It were good therefore to try it with *Milk* sodden, and with *Cream*; for that *Milk* of it self, is such a Compound Body of *Cream*, *Cruds*, and *Whey*, as it is easily turned and dissolved. It were good also to try the *Beer*, when it is in *Wort*, that it may be seen, whether the *Hanging* in the *Well*, will accelerate the ripening and Clarifying of it.

Divers, wee see, do *Stut*. The *cause* may be (in most) the *Refrigeration* of the *Tongue*, whereby it is less apt to move; and therefore we see, that *Naturals* do generally *Stut*: And we see, that in those that *Stut*, if they drink *Wine* moderately, they *Stut* less, because it heateth: And so we see that they that *Stut*, *Stut* more in the first offer to speak, than in continuance; because the *Tongue* is, by motion, somewhat heated. In some also it may be (though rarely) the *dryness* of the *Tongue*, which likewise maketh it less apt to move as well as cold; for it is an affect that cometh to some wise and great men, as it did unto *Moses*, who was *Lingua Prædita*: And many *Stutters* (we find) are very *Cholerelick*, Men, *Choler* enducing a *dryness* in the *Tongue*.

Smelles and other *Odors* are sweeter in the *Air*, at some distance, than near the *Noses*, that hath been partly touched heretofore. The *cause* is double first, the finer mixture or incorporation of the *Smell*. For we see, that in *Sounds* likewise, they are sweetest, when we cannot hear every part by it self. The other *reason* is, For that all *sweet Smells* have joyned with them some *Earthy* or *Crude Odors*; and at some distance the *Sweet*, which is the more spiritual, is perceived; and the *Earthy* reacheth not so far.

Sweet Smells are most forcible in *dry Substances*, when they are broken and so likewise in *Orenges*, or *Lemmons*, the nipping off their *Rinde*, giveth out their *Smell* more: And generally, when *Bodies* are moved or stirred, though not broken, they *Smell* more, as a *Sweet-bag* waved. The *cause* is double; the one, for that there is a greater emission of the *Spirit*, when way is made. And this holdeth in the *Breaking*, *Nipping*, or *Crushing*; it holdeth also, (in some degree) in the *Moving*. But in this last, there is a concurrence of the second *cause*, which is the *Impulsion* of the *Air*, that bringeth the *Scent* faster upon us.

The daintiest *Smells* of *Flowers*, are out of those *Plants* whose *Leaves*, smell not; as *Violets*, *Roses*, *Wall-flowers*, *Gilly-flowers*, *Pincks*, *Woodbine*, *Vine-flowers*, *Apple-bloom*, *Limetree-blooms*, *Bean-blooms*, &c. The *cause* is, for that where there is heat and strength enough in the *Plant* to make the *Leaves* odorate, there the *Smell* of the *Flower* is rather evanide and weaker than that of the *Leaves*; as it is in *Rosemary flowers*, *Lavender-flowers*, and *Sweet-Brier Roses*, But where there is less *Heat*, there the *Spirit* of the *Plant* is digested and refined, and severed from the grossier *Juyce* in the *Efflorescence*, and not before.

386.
Experiment
Solitary,
touching the
Stutting.

387.
Experiment
in Consort,
touching the
Smell.

388.

389.

Most

390.

Most *Odors* smell best, *broken*, or *crusht*, as hath been said; but *Flowers pressed* or *beaten*, do lose the freshness and sweetness of their *Odor*. The *cause* is, for that when they are *crushed*, the grosser and more *Earthy Spirit* cometh out with the *Finer*, and troubleth it; whereas in stronger *Odors* there are no such degrees of the issue of the *Smell*.

391.
Experiment
in Consort,
touching the
Goodness and
Choice of Wa-
ter.

IT is a thing of a very good use, to discover the *goodness of Water*. The *taste* to those that drink *Water* onely doth somewhat: But other *Experiments* are more sure. First, try *Waters* by *Weight*, wherein you may find some difference, though not much: And the *lighter*, you may account the better.

392.

Secondly, Try them by *boiling* upon an *equal fire*; and that which consumeth away fastest, you may account the best.

393.

Thirdly, Try them in *several Bottles* or open *Vessels*, mat ches in every thing else, and see which of them *last longest* without *stench* or *corruption*; and that which holdeth unputrified longest, you may likewise account the best.

394.

Fourthly, Try them by *making Drinks*, stronger or smaller, with the same *Quantity of Malt*; and you may conclude that, that *Water*, which maketh the *stronger Drink*, is the more concocted and nourishing; though perhaps it be not so good for *Medicinal use*. and such *Water* (commonly) is the *Water of large and navigable Rivers*; and likewise in *large and clean Ponds of standing Water*: For upon both them, the *Sun* hath more power than upon *Fountains*, or *small Rivers*. And I conceive, that *Chalk water* is next them the best, for going furthest in *Drink*. For that also helpeth *concoction*, so it be out of a *deep Well*; for then it cureth the rawness of the *Water*; but *Cha'ky-water* towards the top of the *Earth*, is too fretting, as it appeareth in *Laundry of Cloaths*, which wear out apace, if you use such *Water*.

395.

Fifthly, The *Houswives* do find a difference in *Waters*, for the *bearing* or not *bearing of Soap*; and it is likely, that the more *fat water* will bear *Soap* best, for the *Hungry Water* doth kill the unctuous nature of the *Soap*.

396.

Sixthly, You may make a judgment of *Waters* according to the *place*, whence they spring or come. The *Rain-water* is by the *Physicians* esteemed the finest and the best; but yet it is said to putrifie soonest, which is likely, because of the fineness of the *Spirit*; and in *Conservatories of Rain-water*, (such as they have in *Venice*, &c.) they are found, not so choice *Waters*; (the worse perhaps) because they are covered aloft, and kept from the *Sun*. *Snow-water* is held unwholesome, inso much, as the people that dwell at the *Foot of the Snow mountains*, or otherwise upon the *ascent*s (especially the *Women*) by drinking of *Snow-water*, have great bags hanging under their *Throats*. *Well Water*, except it be upon *Chalk*, or a very plentiful *Spring* maketh *Meat* red, which is an ill sign. *Springs* on the *tops of high Hills* are the best; for both they seem to have a *Lightness* and *Appetite of Mounting*; and besides, they are most pure and unmingled: And again are more percolated through a great space of *Earth*. For *Waters in Valleys*, joyn in effect under ground with all *Waters* of the same *Level*; whereas *Springs* on the *tops of Hills*, pass through a great deal of pure *Earth* with less mixture of other *Waters*.

397.

Seventhly, Judgment may be made of *Waters* by the *Soyl* whereupon the *Water* runneth, as *Pebble* is the cleanest and best tasted; and next to that *Clay*

Clay-water; and thirdly, *Water upon Chalk*; Fourthly, that upon *Sand*; and worst of all, upon *Mud*. Neither may you trust *Waters* that taste sweet, for they are commonly found in Rising grounds of great *Cities*, which must needs take in a great deal of filth.

IN *Peru*, and divers parts of the *West-Indies*, though under the *Line*, the *Heats* are not so intolerable, as they be in *Barbary*, and the Skirts of the *Torrid Zone*. The *causes* are, first, the great *Brizes* which the motion of the *Air* in great *Circles* (such as are under the *Girdle* of the *World*) produceth, which do refrigerate; and therefore in those parts, Noon is nothing so hot when the *Brizes* are great, as about nine or ten of the clock in the *Forenoon*. Another *cause* is, for that the length of the *Night*, and the *Dews* thereof, do compence the *Heat* of the day. A third *cause* is, the stay of the *Sun*; not in respect of day and night (for that we spake of before) but in respect of the *Season*: For under the *Line*, the *Sun* crosseth the *Line* and maketh two *Summers* and two *Winters*; but in the skirts of the *Torrid Zone*, it doubleth and goeth back again, and so maketh one long *Summer*.

THE *Heat* of the *Sun* maketh *Men* black in some Countreys, as in *Æthiopia* and *Guinny*, &c. *Fire* doth it not as we see in *Glass-Men*, that are continually about the *Fire*. The reason may be, because *Fire* doth lick up the *Spirits* and *Blood* of the *Body*, so as they exhale; so that it ever maketh *Men* look *Pale* and *Sallow*; but the *Sun* which is a gentler heat doth but draw the *Blood* to the outward parts, and rather concocteth it then soketh it: And therefore, we see that all *Æthiopes* are fleshy, and plump, and have great *Lips*. All which betoken *moisture* retained, and not drawn out. We see also, that the *Negroes* are bred in Countries that have plenty of *Water*, by *Rivers* or otherwise: For *Mero*, which was the *Metropolis* of *Æthiopia*, was upon a great *Lake*; and *Congo*, where the *Negroes* are, is full of *Rivers*. And the confines of the *River Niger*, where the *Negroes* also are, are well watered; and the *Region* about *Capo Verde* is likewise moist, inso-much, as it is pestilent through *moisture*: But the Countreys of the *Abys-senes*, and *Barbary*, and *Peru*, where they are *Tawney* and *Olivaster*, and *Pale*, are generally more sandy and dry. As for the *Æthiopes*, as they are plump and fleshy, so (it may be) they are *Sanguine* and *Ruddy* coloured, if their *Black Skin* would suffer it to be seen.

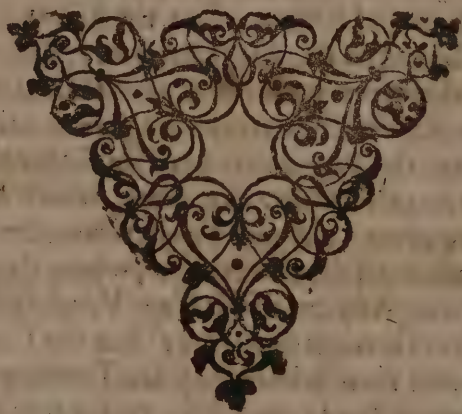
SOME *Creatures* do move a good while after their head is off, as *Birds*. Some a very little time, as *Men* and all *Beasts*. Some move, though cut in several pieces, as *Snakes*, *Eels*, *Worms*, *Flies*, &c. First, therefore it is certain that the *immediate cause* of *Death*, is the resolution or extinguishment of the *Spirits*; and that the destruction or corruption of the *Organs*, is but the *mediate cause*. But some *Organs* are so peremptorily necessary, that the extinguishment of the *Spirits* doth speedily follow; but yet so, as there is an *interim* of a small time. It is reported by one of the *Ancients*, of credit, That a *Sacrificed Beast* hath lowed after the *Heart* hath been severed; and it is a report also of credit, that the *Head* of a *Pig* hath been opened, and the *Brain* put into the *Palm* of a *Mans Hand*, trembling without breaking any part of it, or severing it from the *Marrow* of the *Back-bone*: during which time, the *Pig* hath been, in all appearance, stark dead, and without motion: And after a small time the *Brain* hath been replaced

398.
Experiment
Solitary,
touching the
Temperate
Heat under
the Equi-
noctial.

399.
Experiment
Solitary,
touching the
Coloration of
Black and
Tawny Moors.

400.
Experiment
Solitary,
touching
Motion after
the Instant of
Death.

and the Skull of the Pig closed, and the Pig hath a little after gone about. And certain it is, that an *Eye* upon *Revenge*, hath been thrust forth, so as it hanged a pretty distance by the *Visual Nerve*; and during that time, the *Eye* hath been without any power of *Sight*; and yet after (being replaced) recovered *Sight*. Now the *Spirits* are chiefly in the *Head*, and *Cells* of the *Brain*, which in *Men* and *Beasts* are large; and therefore, when the *Head* is off, they move little or nothing: But *Birds* have small *Heads* and therefore the *Spirits* are a little more dispersed in the *Sinews*, whereby *Motion* remaineth in them a little longer; insomuch as it is extent in story, that an *Emperor of Rome*, to shew the certainty of his hand, did shoot a great forked Arrow at an *Estrich*, as she ran swiftly upon the Stage, and stroke off her Head; and yet she continued the race a little way with her Head off. As for *Worms*, and *Flies*, and *Eels*, the *Spirits* are diffused almost all over; and therefore they move in their several pieces.

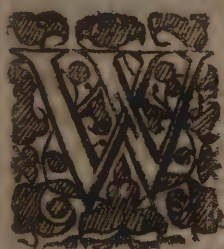


NATURAL



NATURAL HISTORY;

Century V.



We will now enquire of *Plants* or *Vegetables*; and we shall do it with diligence. They are the principal part of the *Third days Work*; they are the first *Producat*, which is the word of *Animation*: for the other words are but the words of *Essence*; and they are of excellent and general use, for *Food*, *Medicine*, and a number of *Mechanical Arts*.

Experiments
in Consort
touching the
Acceleration
of Germinati-
on.

There were sown in a Bed, *Turnip seed*, *Raddish seed*, *Wheat*, *Cucumber seed* and *Pease*. The Bed we call a *Hot-bed*, and the manner of it is this. There was taken *Horse-dung*, old, and well rotted; this was laid upon a Bank, half a foot high, and supported round about with Planks; and upon the top was cast sifted Earth, some two fingers deep; and then the Seed sprinkled upon it, having been steeped all night in Water mixed with *Cow-dung*. The *Turnip seed*, and the *Wheat*, came up half an inch above ground, within two dayes after, without any watering; the rest the third day. The Experiment was made in *October*, and (it may be) in the *Spring* the *Accelerating* would have been the speedier. This is a noble Experiment, for, without this help, they would have been four times as long in coming up. But there doth not occur to me, at this present, any use thereof for profit, except it should be for Sowing of *Pease*, which have their price very much increased by the early coming. It may be tryed also with *Cherries*, *Strawberries*, and other fruit, which are dearest, when they come early.

401.

There was *Wheat* steeped in *Water* mixed with *Cow-dung*. Other in *Water* mixed with *Horse-dung*, other in *Water* mixed with *Pigeon-dung*,

402.

other in *Urine of Man*, other in *Water* mixed with *Chalk* powdred, other in *Water* mixed with *Soot*, other in *Water* mixed with *Ashes*, other in *Water* mixed with *Bay-salt*, other in *Claret Wine*, other in *Malmsey*, other in *Spirit of Wine*. The proportion of the mixture was, a fourth part of the ingredients to the *Water*, save that there was not of the *Salt* above an eighth part. The *Urine*, and *Wines*, and *Spirit of Wine*, were simple without mixture of *Water*; the time of steeping was twelve hours; the time of the year *October*. There was also other *Wheat* sown *unsteeped*, but *watered* twice a day with *warm Water*; there was also other *Wheat* sown *simple*, to compare it with the rest. The event was, that those that were in the mixture of *Dung*, and *Urine*, *Soot*, *Chalk*, *Ashes*, and *Salt*, came up within six days: and those that afterwards proved the highest, thickest, and more lusty, were first the *Urine*, and then the *Dung*; next the *Chalk*, next the *Soot*, next the *Ashes*, next the *Salt*, next the *Wheat simple* of it self *unsteeped* and *unwatered*, next the *watered twice a day* with *warm Water*, next the *Claret Wine*. So that these three last were slower than the ordinary *Wheat* of it self; and this Culture did rather retard than advance. As for those that were steeped in *Malmsey*, and *Spirit of Wine*, they came not up at all. This is a rich Experiment for profit; for the most of the steepings are cheap things, and the goodness of the crop is a great matter of gain, if the goodness of the crop answer the earliness of the coming up, as it is like is will, both being from the vigor of the *Seed*, which also partly appeared in the former Experiments as hath been said. This Experiment would be tryed in other *Grains*, *Seeds*, and *Kernels*; for it may be some steeping will agree best with some *Seeds*. It would be also tryed with *Roots* steeped as before, but for *longer time*; it would be tryed also in *several seasons* of the Year, especially in the *Spring*.

403.

Strawberries watered now and then (as once in three days) with *Water* wherein hath been steeped *Sheeps-dung*, or *Pigions-dung*, will prevent and come early. And it is like the same effect would follow in other *Berries*, *Herbs*, *Flowers*, *Grains*, or *Trees*; and therefore it is an Experiment, though vulgar in *Strawberries*, yet not brought into use generally: For it is usual to help the Ground with Muck, and likewise to recomfort it sometimes with Muck put to the *Roots*, but to water it with *Muck-wates*, which is like to be more forcible, is not practised.

404.

Dung, or *Chalk*, or *Blood*, applied in substance (seasonably) to the *Roots* of *Trees*, doth set them forwards. But to do it unto *Herbs*, without mixture of *Water* or *Earth*, it may be these helps are too hot.

405.

The former means of helping *Germination*, are either by the goodness and strength of the *Nourishment*, or by the comforting and exciting the *Spirits* in the *Plant*, to draw the *Nourishment* better. And of this latter kind concerning the comforting of the *Spirits* of the *Plant*, are also the Experiments that follow; though they be not applications to the *Root* or *Seed*. The planting of *Trees* warm upon a *Wall*, against the *South* and *South-East* *Sun*, doth hasten their coming on and ripening; and the *South-East* is found to be better than the *South-west*, though the *South* west be the hotter *Coast*. But the cause is chiefly, for that the heat of the morning succeedeth the cold of the night; and partly, because (many times) the *South-West* *Sun* is too parching. So likewise planting of them upon the *Back* of a *Chimney* where a fire is kept, doth hasten their coming on, and ripening: Nay more, the drawing of the *Boughs* into the *inside* of a *room*, where a *Fire* is continually kept, worketh the same effect, which bath

hath been tryed with Grapes; insomuch, as they will come a Moneth earlier, then the Grapes abroad.

Besides the two *Means of Accelerating Germination*, formerly described that is to say, the *mending* of the *Nourishment*, *comforting* of the *Spirit* of the *Plant*; there is a third, which is the *making way* for the *easse* coming to the *Nourishment*, and *drawing* it. And therefore *gentle digging* and *loosning* of the *Earth* about the *Roots* of *Trees*, and the *removing Herbs* and *Flowers* into new *Earth* once in two years (which is the same thing, for the new *Earth* is ever looser) doth greatly further the *prospering* and *earliness* of *Plants*.

But the most admirable *Acceleration* by facilitating the *Nourishing*, is that of *Water*. For a *Standard* of a *Damask Rose* with the *Root*, was set in a *Chamber*, where no *Fire* was, upright in an *Earthen Pan*, full of fair *Water*, without any mixture, half a foot under the *Water*, the *Standard* being more than two foot high above the *Water*. Within the space of ten days the *Standard* did put forth a fair green *Leaf*, and some other little *Buds*, which stood at a stay without any shew of decay or withering, more then seven days. But afterwards that *Leaf* faded, but the young *Buds*, did sprout on, which afterward opened into fair *Leaves*, in the space of three Moneths, and continued so a while after, till upon removal we left the tryal. But note, that the *Leaves* were somewhat paler, and light coloured then the *Leaves* use to be abroad. Note, that the first *Buds* were in the end of *October*, and it is likely, that if it had been in the *Spring* time, it would have put forth with greater strength, and (it may) be to have grown on to bear *Flowers*. By this means, you may have (as it seemeth) *Roses* set in the midst of a *Pool*, being supported with some stay, which is matter of rareness and pleasure, though of small use. This is the more strange, for that the like *Rose Standard* was put at the same time into *Water* mixed with *Horse-dung*, the *Horse-dung* about the fourth part to the *Water*, and in four moneths space (while it was observed) put not forth any *Leaf*, though divers *Buds* at the first, as the other.

A *Dutch Flower* that had *Bulbons Root*, was likewise put at the same time all under *Water*, some two or three fingers deep; and within seven days sprouted, and continued long after further growing. There was also put in a *Beet-root*, a *Borrage-root*, and a *Reddish-root*, which had all their *Leaves* cut almost close to the *Roots*; and within six weeks had fair *Leaves*, and so continued till the end of *November*.

Note, that if *Roots*, or *Pease*, or *Flowers*, may be accelerated in their coming and ripening, there is a double profit, the one in the high price that those things bear when they come early, the other in the swiftness of their returns: For in some Grounds which are strong, you shall have a *Raddish* &c. come in a Moneth, that in other Grounds will not come in w, and so make double returns.

Wheat also was put into the *Water*, and came not forth at all; so as it seemeth there must be some strength and bulk in the Body, put into the *Water*, as it is in *Roots*; for *Grains*, or *Seeds*, the cold of the *Water* will mortifie. But casually some *Wheat* lay under the pan, which was somewhat moistened by the suing of the pan, which in six weeks (as aforesaid, looked mouldy to the eye, but it was sprouted forth half a fingers length.

It seemeth by these *Instances of Water*, hath for nourishment the *Water* is almost all in all, and hath the *Earth* doth but keep the plant upright, and save it from over-heat, and over-cold; and therefore is a comfortable Experiment for good *Drinkers*. It proveth also hath our former opinion hath

Drink

406.

409.

410.

Drink incorporate with Flesh or Roots (as in *Capon-Beer*, &c.) will nourish more easily, than Meat and Drink taken severally.

412.

The *Housing of Plants* (I conceive) will both *Accelerate Germination*, and bring forth *Flowers and Plants* in the *colder Seasons*: And as we *House* our own *Country Plants* to forward them, and make them come in the cold Seasons, in such sort, that you may have *Violets*, *Strawberries* *Pease*, all Winter: So that you sow or remove them at fit times. This *Experiment*, is to be referred unto the *comforting* of the *Spirit* of the *Plant* by *warmth* as well as *Housing* their *Boughs*, &c. So then the means to *Accelerate Germination*, are in particular eight, in general three.

413.

Experiments
in Consort,
touching the
Putting back
or Retardation
of Germination.

TO make *Roses* or other *Flowers* come late, it is an *Experiment* of *Pleasure*. For the *Ancients* esteemed much of *Rosa Sera*, and indeed the *November Rose* is the sweetest, having been less exhiled by the *Sun*. The Means are these. First, The cutting off their tops immediately after they have done bearing, and then they will come again the same year about *November*; but they will not come just on the tops where they were cut, but out of those *Shoots* which were (as it were) *Water-boughs*. The cause is, for that the *Sap*, which otherwise would have fed the top (though after bearing) will, by the discharge of that, divert unto the side *Sprouts*, and they will come to bear, but later:

414.

The second is *Pulling off the Buds of the Rose*, when they are newly knotted, for then the side *Branches* will bear. The cause is the same with the former: For *cutting off the Tops*, and *pulling off the Buds*, work the same effect, in *Retention* of the *Sap* for a time, and *Diversion* of it to the *Sprouts*, that were not so forward.

415.

The third is the *cutting off* some few of the *Top-boughs* in the *Spring time*, but suffering the lower *Boughs* to grow on. The cause is, for that the *Boughs* do help to draw up the *Sap* more strongly; and we see that in *Powling of Trees*, many do use to leave a *Bough* or two on the top to help to draw up the *Sap*. And it is reported also, That if you graft upon the *Bough* of a *Tree*, and cut off some of the old *Boughs*, the new *Cions* will perish.

416.

The fourth is by *laying the Roots bare about Christmas* some days. The cause is plain, for that it doth arrest the *Sap* from going upwards for a time; which arrest, is afterwards released by the covering of the *Root* again with *Earth*, and then the *Sap* getteth up, but later.

417.

The fifth is the *removing* of the *Tree* some *Moneth* before it *Buddeth*. The cause is for that some time will be required after the *Remove*, for the *Resetling*, before it can draw the *Juyce*; and that time being lost, the *blottom* must needs come forth later.

418.

The sixth is the *Grafting of Roses* in *May*, which commonly *Gardiners* do not till *July*, and then they bear not till the next year; but if you graft them in *May* they will bear the same year, but late.

419.

The seventh is the *Girding* of the *Body* of the *Tree* about with some *Packthred* for that also in a degree restraineth the *Sap*, and maketh it come up more late, and more slowly.

420.

The eighth is the *Planting* of them in a *Shade* or in a *Hedge*. The cause is, partly the keeping out of the *Sun*, which hastneth the *Sap* to rise, and partly the robbing of them of *Nourishment* by the stuff in the *Hedge*. These

these means may be practised upon other, both Trees, and Flowers, *Mutatis Mutandis*.

Men have entertained a conceit that sheweth prettily, namely, That if you graft a *Late coming Fruit*, upon a Stock of a *Fruit tree* that *cometh early*, the Graft will bear *Fruit-early*, as a Peach upon a Cherry. And contrariwise, if an *Early coming-Fruit* upon a Stock of a *Fruit-tree* that *cometh late*, the Graft will bear a Fruit late; as a Cherry upon a Peach. But these are but imaginations, and untrue. The *cause* is, for that the Cions overruleth the Stock quite, and the Stock is but Passive onely, and giveth Aliment, but no Motion to the Graft.

WE will speak now, how to make *Fruits, Flowers, and Roots* larger, in more plenty and sweeter than they use to be; and how to make the *Tree* themselves more tall, more spread, and more hasty and sudden, than they use to be. Wherein there is no doubt, but the former *Experiments of Acceleration* will serve much to these purposes. And again, that these *Experiments* which we shall now set down, do serve also for *Acceleration*, because both Effects proceeds from the encrease of Vigor in the Tree; but yet to avoid confusion. And because some of the Means are more proper for the one effect, and some for the other. We will handle them apart.

It is an assured Experience, That an *heap of flint or Stone*, laid about the bottom of a *Wilde Tree*, (as in Oak, Elm, Ash, &c.) upon the first planting doth make it prosper double as much as without it. The *cause* is, for that it retaineth the moisture which falleth at any time upon the *Tree*, and suffereth it not to be exhaled by the Sun. Again, it keepeth the *Tree* warm from cold Blasts and Frosts, as it were in an House. It may be also, there is somewhat in the keeping of it steady at the first. *Quere*, if laying of Straw some height about the Body of a *Tree*, will not make the *Tree* forwards. For though the Root giveth the Sap, yet it is the Body that draweth it. But you must note, that if you lay *Stones* about the Stalk of Lettuce, or other Plants that are more soft, it will over moisten the Root so as the worms will eat them.

A *Tree* at the first setting, should not be shaken, until it hath taken Root fully; and therefore some have put two little Forks about the bottom of their *Trees*, to keep them upright but after a years rooting, then shaking doth the *Tree* good by loosning of the Earth, and (perhaps) by exercising (as it were) and stirring the Sap of the *Tree*.

Generally, the cutting away of *Boughs* and *Suckers* at the Root and Body, doth make *Trees* grow high: and contrariwise, the *Powling*, and Cutting of the top, maketh them grow, spread, and bushy: as we see in *Pollards*, &c.

It is reported, That to make hasty growing *Coppice wood*, the way is to take, *Willow, Sallow, Popler, Alder*, of some seven years growth: and to set them, not upright, but aslope, a reasonable depth under the Ground; and then instead of one Root they will put forth many, and so carry more shoots upon a Stem.

When you would have many new *Roots of Fruit-trees*, take a low *Tree*, and bow it, and lay all his Branches a flat upon the ground, and cast Earth upon them, and every twig will take Root. And this is a very profitable Experiment for costly *Trees*, (for the *Boughs* will make Stocks without charge) such as are *Apricots, Peaches, Almonds, Cornelians, Mulberries, Figs*, &c.

421.

Experiments
in Consort,
touching the
Majoration of
Fruits, Trees,
and Plants.

422.

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424.

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426.

&c. The like is continually practised with *Vines, Roses, Musk-Roses,* &c.

427. From *May* to *July* you may take off the *Bark* of any *Bough*, being of the bigness of *Three* or *four* Inches, and cover the bare place, somewhat above and below with *Loam*, wel tempered with *Horse-dung*, binding it fast down. Then cut off the *Bough* about *Alhollantide* in the bare place, and set it in the *Ground*, and it will grow to be a fair *Tree* in one year. The cause may be, for that the *Bearing* from the *Bark*, keepeth the *Sap* from descending towards *Winter*, and so holdeth it in the *Bough*; and it may be also, that *Loam* and *Horse-dung* applied to the bare place, do moisten, it and cherish it, and make it more apt to put forth the *Root*. Note, that this may be a general means for keeping up the *Sap* of *Trees* in their *Boughs*, which may serve to other effects.

428. It hath been practised in *Trees*, that shew fair and bear not, to bore a hole thorow the *Heart* of the *Tree*, and thereupon it will bear. Which may be, for that the *Tree* before hath too much *Repletion*, and was oppressed with his own *Sap*; for *Repletion* is an enemy to *Generation*.

429. It hath been practised in *Trees* that do not bear, to cleave two or three of the chief *Roots*, and to put into the Cleft a small *Pebble*, which may keep it open, and then it will bear. The cause may be, for that a *Root* of a *Tree* may be (as it were) hide-bound, no less than the *Body* of the *Tree*; but it will not keep open without somewhat put into it.

430. It is usually practised to set *Trees* that require much *Sun*, upon *Walls* against the *South*; as *Apricots, Peaches, Plumbs, Vines, Figs*, and the like. It hath a double commodity; the one, the heat of the *Wall* by reflection; the other, the taking away of the shade: For when a *Tree* groweth round; the upper *Boughs* over shadow the lower, but when it is spread upon a *Wall*, the *Sun* cometh alike upon the upper and lower *Branches*.

431. It hath also been practised (by some) to pull off some *Leaves* from the *Trees* so spread, that the *Sun* may come upon the *Bough* and *Fruit* the better. There hath been practised also a curiosity, to set a *Tree* upon the *North side* of a *Wall*, and at a little hieght, to draw him through the *Wall*, and spread him upon the *Southside*; conceiving, that the *Root* and lower part of the *Stock* should enjoy the freshness of the shade, and the upper *Boughs* and *Fruit*, the comfort of the *Sun*, but it sorted not. The cause is, for that the *Root* requireth some comfort from the *Sun*, though under *Earth*, as well as the *Body*; and the lower part of the *Body* more than the upper, as we see in compassing a *Tree* below with *straw*.

432. The lowness of the *Bough*, where the *Fruit* cometh, maketh the *Fruit* greater, and to ripen better; for you shall ever see in *Apricotes, Peaches*, or *Melo-Cotones* upon a *Wall*, the greatest *Fruits* towards the bottom. And in *France* the *Grapes* that make the *Wine*, grow upon low *Vines*, bound to small *Stakes*; and the raised *Vines* in *Arbors*, make but *Verjuyce*. It is true, that in *Italy*, and other *Countreys* where they have hotter *Sun*, they raise them upon *Elms* and *Trees*: But I conceive, that if the *French* manner of *Planting* low, were brought in use, there their *Wines* would be stronger and sweeter: But it is more chargeable in respect of the *Props*. It were good to try whether a *Tree* grafted somewhat near the ground, and the lower *Boughs* onely maintained, and the higher continually proynd off would not make a larger *Fruit*.

433. To have *Fruit* in greater plenty, the way is to graft, not onely upon young *Stocks*, but upon divers *Boughs* of an old *Tree*; for they will bear

great numbers of Fruit; whereas if you graft but upon one Stock, the Tree can bear but few.

The Digging yearly about the *Roots of Trees*, which is a great means both to the *Acceleration* and *Melioration of Fruits*, is practised in nothing but in *Vines*; which, if it were transferred unto other *Trees* and *Shrubs*, (as *Roses*, &c.) I conceive, would advance them likewise.

It hath been known, that a *Fruit-tree* hath been blown up (almost) by the *Roots*, and set up again, and the next year bare exceedingly. The cause of this was nothing but the *loosening* of the *Earth*, which comforteth any *Tree*, and is fit to be practised more than it is in *Fruit-Trees*: For *Trees* cannot be so fitly removed into new *Grounds*, as *Flowers* and *Herbs* may.

To revive an *old Tree*, the digging of it about the *Roots*, and applying new Mould to the *Roots*, is the way. We see also that *Draught-Oxen* put into *Fresh Pasture*, gather new and tender flesh; and in all things, better nourishment than hath been used, doth help to renew, especially, if it be not onely better but changed, and differing from the former.

If an *Herb* be cut off from the *Roots*, in the beginning of *Winter*, and then the *Earth* be trodden and beaten down hard with the *Foot* and *spade*, the *Roots* will become of very great magnitude in *Summer*. The reason is, for that the moisture being forbidden to come up in the *Plant*, stayeth longer in the *Root*, and so dilateth it. And *Gardeners* use to tread down any loose *Ground* after they have sown *Onions*, or *Turnips*, &c.

If *Panicum* be laid below, and about the bottom of a *Root*, it will cause the *Root* to grow to an excessive bigness. The cause is, for that being it self of a spongy substance, it draweth the moisture of the *Earth* to it, and so feedeth the *Root*. This is of greatest use for *Onions*, *Turnips*, *Parsnips*, and *Carrets*.

The shifting of *Ground* is a means to better the *Tree* and *Fruit*; but with this *Caution*, That all things do prosper best, when they are advanced to the better. Your *Nursery of Stocks* ought to be in a more barren *Ground*, than the *Ground* is whereunto you remove them. So all *Grassiers* prefer their *Cattle* from meaner *Pastures* to better. We see also, that hardness in youth lengthneth life, because it leaveth a cherishing to the better of the *Body* in *Age*: Nay, in exercises it is good to begin with the hardest, as *Dancing* in thick *Shoes*, &c.

It hath been observed that *Hacking of Trees* in their *Bark*, both down, right, and a cross, so as you make them rather in slices, than in continued Hacks, doth great good to *Trees*, and especially delivereth them from being *Hide-bound*, and killeth their *Moss*.

Shade to some *Plants* conduceth to make them large and prosperous more than *Sun*; as in *Strawberries* and *Bays*, &c. Therefore amongst *Strawberries*, sow here and there some *Borage-Seed*; and you shall find the *Strawberries* under those *Leaves*, far more large than their fellows. And *Bays* you must plant to the *North*, or defend them from the *Sun* by a *Hedge-Row*; and when you sow the *Berries*, weed not the *Borders* for the first half year; for the *Weed* giveth them *Shade*.

To increase the *Crops of Plants*, there would be considered, not onely the increasing the *Lust* of the *Earth*, or of the *Plant*, but the saving also of that which is spilt. So they have lately made a tryal to set *Wheat*; which nevertheless hath been left off, because of the trouble and pains; yet so much is true, that there is much saved by the *Setting*, in comparison of that

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that which is *Sowen*, both by keeping it from being picked up by Birds, and by avoiding the shallow lying of it, whereby much that is sown, taketh no Root.

443. It is prescribed by some of the *Ancients*, that you take *Small Trees*, upon which *Figs* or other *Fruit* grow, being yet unripe, and cover the *Trees* in the middle of *Autumn* with *Dung* until the Spring, and then take them up in a warm day, and replant them in good Ground; and by that means, the former years *Tree* will be ripe, as by a new Birth, when other *Trees* of the same kind do but blossom. But this seemeth to have no great probability.

444. It is reported, that if you take *Nitre*, and mingle it with *Water*, to the thickness of *Honey*, and therewith anoint the *Bud*, after the *Vine* is cut, it will sprout forth within eight days. The Cause is like to be (if the Experiment be true) the opening of the *Bud*, and of the parts contiguous, by the Spirit of the *Nitre*; for *Nitre* is (as it were) the life of *Vegetables*.

445. Take *Seed* or *Kernels* of *Apples*, *Pears*, *Oranges*, or a *Peach*, or a *Plumb-stone*, &c. And put them into a *Squill*, (which is like a great *Onion*, and they will come much earlier then the *Earth* it self. This I conceive to be as a kind of *Grafting* in the *Root*; for as the Stock of a *Graft* yieldeth better prepared nourishment to the *Graft*, than the *Crude Earth*; so the *Squill* doth the like to the *Seed*; and, I suppose, the same would be done, by putting *Kernels* into a *Turnip*, or the like, save that the *Squill* is more vigorous and hot. It may be tryed also, with putting *Onion-seed* into an *Onion-Head*, which thereby (perhaps) will bring forth a larger and earlier *Onion*.

446. The pricking of a *Fruit* in several places, when it is almost at his bigness, and before it ripeneth, hath been practised with success, to ripen the *Fruit* more suddenly. We see the example of the biting of *Wasps* or *Worms* upon *Fruit* (whereby it manifestly) ripeneth the sooner.

447. It is reported, That *Alga Marina* (*Sea-weed*) put under the *Roots* of *Cole-worts*, and (perhaps) of other *Plants*, will further their growth. The Vertue (no doubt) hath relation to *Salt*, which is a great help to Fertility.

448. It hath been practised to cut off the *Stalks* of *Cucumbers*, immediately after their bearing, close by the *Earth*; and then to cast a pretty quantity of *Earth* upon the *Plant* that remaineth, and they will bear the next year *Fruit* long before the ordinary time. The Cause may be, for that the *Sap* goeth down the sooner, and is not spent in the *Stalk* or *Leaf*, which remaineth after the *Fruit*. Where note, that the *Dying*, in the *Winter*, of the *Roots* or *Plants* that are *Annual*, seemeth to be partly caused by the over-expende of the *Sap* into *Stalk* and *Leaves*; which being prevented, they will superannuate, if they stand warm.

449. The pulling off many of the *Blossoms* from a *Fruit Tree*, doth make the *Fruit* fairer. The cause is manifest, for that the *Sap* hath the less to nourish. And it is a common experience, That if you do not pull off some *Blossoms*, the first time a *Tree* bloometh, it will blossom it self to death.

450. It were good to try what would be the effect, if all the *Blossoms* were pulled from a *Fruit-tree*, or the *Acorns* and *Chestnut-buds*, &c. From a *wild Tree*, for two years together. I suppose that the *Tree* will either put forth the third year bigger and more plentiful *Fruit*; or else, the same years, larger *Leaves*, because of the *Sap* stored up.

It hath been generally received, that a *Plant watered with warm Water*, will come up sooner and better, than with cold Water, or with Showers, But our *Experiment of watering Wheat with warm Water* (as hath been said) succeeded not; which may be, because the tryal was too late in the Year, viz. in the end of *October*. For the Cold then coming upon the *Seed*, after it was made more tender by the warm Water, might check it.

451.

There is no doubt, but that *Grafting* (for the most part) doth *meliorate* the *Fruit*. The *cause* is manifest, for that the nourishment is better prepared in the *Stock*, than in the *Crude Earth*: But yet note well, that there be some *Trees* that are said to come up more happily from the *Kernel*, than from the *Graft*; as the *Peach*, and *Melocotone*. The *cause*, I suppose to be, for that those *Plants* require a nourishment of great moisture; and though the nourishment of the *Stock* be finer, and better prepared, yet it is not so moist and plentiful, as the nourishment of the *Earth*. And indeed we see those *Fruits* are very cold *Fruits* in their Nature.

452.

It hath been received, that a smaller *Pear*, grafted upon a *Stock* that beareth a greater *Pear*, will become great. But I think it is as true, as that of the *Prime-Fruit* upon the *late Stock*, and *è converso*, which we rejected before; for the *Cions* will govern. Nevertheless, it is probable enough, that if you can get a *Cions* to grow upon a *stock* of another kind, that is much moister than his own *Stock*, it may make the *Fruit* greater, because it will yield more plentiful nourishment, though it is like it will make the *Fruit* baser. But generally the *grafting* is upon a dryer *Stock*; as the *Apple* upon a *Crab*, the *Pear* upon a *Thorn*, &c. Yet it is reported, that in the *Low-Countries* they will graft an *Apple-Cions* upon the *Stock* of a *Colewort*, and it will bear a great flaggy *Apple*; the *Kernel* of which, if it be set, will be a *Colewort*, and not an *Apple*. It were good to try, whether an *Apple-Cions* will prosper, if it be grafted upon a *Sallow* or upon a *Poplar*, or upon an *Alder* or upon an *Elm*, or upon an *Horse-Plum*, which are the moistest of *Trees*. I have heard that it hath been tried upon an *Elm*, and succeeded.

453.

It is manifest by experience. That *Flowers* removed, wax greater, because the nourishment is more easily come by in the loose *Earth*. It may be, that oft re-grafting of the same *Cions*, may likewise make *Fruit* greater, as if you take a *Cions*, and graft it upon a *Stock* the first year; and then cut it off, and graft it upon another *Stock* the second year, and so for a third, or fourth year, and then let it rest, it will yield afterward, when it beareth, the greater *Fruit*.

454.

Of *Grafting*, there are many *Experiments* worth the noting, but those we reserve to a proper place.

It maketh *Figs* better, if a *Fig-tree*, when it beginneth to put forth *Leaves* have his top cut off. The *cause* is plain, for that the *Sap* hath the less to feed, and the less way to mount: But it may be the *Fig* will come somewhat later, as was formerly touched. The same may be tried likewise in other *Trees*.

455.

It is reported, That *Mulberries* will be fairer, and the *Trees* more fruitful, if you bore the *Trunk* of the *Tree* thorow in several places, and thrust into the places bored, *Wedges* of some hot *Trees*; as *Turpentine*, *Mastick-tree*, *Guaiacum*, *Juniper*, &c. The *cause* may be, for that *Adventive* heat doth chear up the *Native Juyce* of the *Tree*.

456.

It is reported, That *Trees* will grow greater and bear better *Fruit*, if you put *Salt*, or *Lees of Wine*, or *Blood* to the *Root*. The *cause* may be the en-

457.

creasing the Lust or Spirit of the *Root*: These things being more forcible than ordinary *composts*.

458. It is reported by one of the Ancients, that *Artichocks* will be less prickly, and more tender, if the *Seeds* have their tops dulled or grated off upon a Stone.

459. *Herbs* will be tenderer, and fairer, if you take them out of *Beds* when they are newly come up, and remove them into *Pots* with better *Earth*. The remove from *Bed* to *Bed* was spoken of before; but that was in several years, this is upon the sudden. The *cause* is the same with other *Removes* formerly mentioned.

460. *Coleworts* are reported by one of the *Ancients*, to prosper exceedingly, and to be better tasted, if they be sometimes watred with *Salt-water*, and much more with *Water* mixed with *Nitre*, the Spirit of which is less Adu-
rent than *Salt*.

461. It is reported, That *Cucumbers* will prove more tender and dainty, if their *Seeds* be steeped (a little) in *Milk*; the *cause* may be, for that the *Seed* being mollified with the *Milk*, will be too weak to draw the grosser Juyce of the *Earth*, but only the finer. The same *Experiment* may be made in *Artichocks*, and other *Seeds*, when you would take away, either their *Fla-*
shiness or *Bitterness*. They speak also, that the like effect followeth of steeping in *Water* mixed with *Honey*; but that seemeth to me not so pro-
bable, because *Honey* hath too quick a Spirit.

462. It is reported, That *Cucumbers* will be less Watry, and more Melonlike, if the Pit where you set them, you fill it (half way up) with *Chaff*, or small Sticks, and then power *Earth* upon them; for *Cucumbers*, as seemeth, do extreemly affect moisture, and over-drink themselves; which this *Chaff* or *Chips* forbiddeth. Nay it is further reported, That if, when a *Cucumber* is grown, you set a *Pot* of water about five or six inches distance from it, it will in Four and twenty hours shoot so much out as to touch the *Pot*; which if it be true, it is an *Experiment* of an higher nature than belongeth to this Title: For it discovereth *Perception* in *Plants* to move towards that which should help and comfort them, though it be at a distance. The ancient Tradition of the *Vine* is far more strange: It is, that if you set a stake, or *Prop*, some distance from it, it will grow that way. Which is far stranger (as is said) than the other: For that *Water* may work by a *Sympathy* of *At-*
traction: But this of the *Stake* seemeth to be a Reasonable Discourse.

463. It hath been touched before, that *Terebration* of *Trees* doth make them prosper better. But it is found also, that it maketh the *Fruit* sweeter, and better. The *cause* is, for that notwithstanding the *Terebration*, they may receive Aliment sufficient, and yet no more than they can well turn, and digest; and withal do sweat out the coursest and unprofitablest Juyce, even as it is in Living Creatures, which by moderate feeding, and exercise, and sweat, attain the soundest habit of Body.

464. As *Terebation* doth Meliorate *Fruit*, so, upon the like reason, doth Letting of *Plants* Blood; as *Pricking* *Vines*, or other *Trees*, after they be of some growth, and thereby letting forth *Gum* or *Tears*, though this be not to continue, as it is in *Terebration*, but at some Seasons. And it is reported, that by this Artifice, *Bitter Almonds* have been turned into Sweet.

465. The Ancients for the Dulcorating of *Fruit*, do commend *Swines-dung*, above all other *Dung*: Which may be, because of the Moisture of that Bealt, whereby the *Excrement* hath less Acrimony; For we see *Swines* and *Pigs* Flesh is the Moistest of Fleashes.

It is observed by some, that all *Herbs* wax sweeter, both in smell and taste, if after they be grown up some reasonable time, they be cut, and so you take the latter Sprout. The cause may be, for that the longer the Juice stayeth in the Root and Stalk, the better it concocteth. For one of the chief causes, why *Grains*, *Seeds*, and *Fruits*, are more nourishing than *Leaves*, is the length of time, in which they grow to *Maturation*. It were not amiss to keep back the Sap of *Herbs*, or the like, by some fit means, till the end of Summer, whereby (it may be) they will be more nourishing.

As *Grafting* doth generally advance and *Meliorate Fruits*, above that which they would be, if they were set of *Kernels* or *Stones*, in regard the nourishment is better concocted: So (no doubt) even in *Grafting*, for the same cause, the choice of the *Stock* doth much; always provided, that it be somewhat inferior to the *Cions*. For otherwise it dulleth it. They commend much the *Grafting* of *Pears*, or *Apples*, upon a *Quince*.

Besides the *Means* of *Melioration* of *Fruits* before-mentioned, it is set down as tried, that a mixture of *Bran* and *Swines-dung*, or *Chaff* and *Swines-dung* (especially laid up together for a moneth to rot) is a very great nourisher and comforter to a *Fruit-tree*.

It is delivered, that *Onions* wax greater, if they be taken out of the Earth, and laid a drying twenty days, and then set again; and yet more, if the outermost Pill be taken off all over.

It is delivered by some, that if one take the *Bough* of a low *Fruit-tree*, newly budded, and draw it gently, without hurting it, into an *Earthen pot* perforate at the bottom to let in the *Plant*, and then cover the *Pot* with Earth, it will yield a very large *Fruit* within the Ground. Which *Experiment* is nothing but *potting* of *Plants*, without removing and leaving the *Fruit* in the Earth. The like (they say) will be effected by an empty *Pot* without Earth in it, put over a *Fruit*, being propped up, with a *stake* as in hangeth upon the *Tree*, and the better, if some few *Pertusions* be made in the *Pot*. Wherein, besides the defending of the *Fruit* from extremity of Sun or Weather, some give a reason, that the *Fruit* loving and coveting the open Air and Sun, is invited by the *Pertusions* to spread and approach as near the open Air as it can, and so enlargeth in *Magnitude*.

All *Trees* in *high* and *Sandy Grounds*, are to be set deep; and in *Watry Grounds* more shallow. And in all *Trees* when they be removed (especially *Fruit-trees*) care ought to be taken, that the sides of the *Trees* be coasted (*North* and *South* &c.) as they stood before. The same is said also of *Stone* out of the *Quarry*, to make it more durable, though that seemeth to have less reason; because the *Stone* lyeth not so near the Sun, as the *Tree* groweth.

Timber Trees in a *Coppice-wood*, do grow better than in an open Field; both, because they offer not to spread so much, but shoot up still in height, and chiefly, because they are defended from too much Sun and Wind which do check the growth of all *Fruit*, and so (no doubt) *Fruit-trees*, or *Vines*, set upon a *Wall* against the Sun, between *Elbows* and *Buttresses* of *Stone* ripen more than upon a plain Wall.

It is said, that if *Potato Roots* be set in a *Pot* filled with Earth, and then the *Pot* with Earth be set likewise within the Ground, some two or three inches, the *Roots* will grow greater than ordinary. The cause may be, for that having Earth enough within the *Pot* to nourish them; and then being stopped by the bottome of the *Pot* from putting strings downward, they must needs grow greater in breadth and thickness. And it may be that

that all *Seeds* or *Roots*, *Potted*, and so set into the *Earth*, will prosper the better.

474.

The cutting off the *Leaves* of *Raddish*, or other *Roots*, in the beginning of *Winter* before they wither; and covering again the *Root*, something high with *Earth*, will preserve the *Root* all *Winter*, and make it bigger in the *Spring* following, as hath been partly touched before. So that there is a double use of this cutting off the *Leaves*: For in *Plants*, where the *Root* is the *Esculent*, as *Raddish*, and *Parships*, it will make the *Root* the greater, and so it will do to the *Heads* of *Onions*, and where the *Fruit* is the *Esculent*, by strengthening the *Root*, it will make the *Fruit* also the greater.

475.

It is an *Experiment* of great pleasure to make the *Leaves* of *shaddy Trees*, larger than ordinary. It hath been tryed (for certain) that a *Cion* of a *Weech Elm*, grafted upon the stock of an ordinary *Elm*, will put forth *Leaves*, almost as broad as the brim of ones *Hat*. And it is very likely, that as in *Fruit Trees*, the *Graft* maketh a greater *Fruit*; so in *Trees* that bear no *Fruit*, it will make the greater *Leaves*. It would be tryed therefore in *Trees* of that kind chiefly; as *Birch*, *Ash*, *Willow*, and especially the *Shining Willow*, which they call *Swallow Tail*, because of the pleasure of the *Leaf*.

476.

The *Barrenness* of *Trees* by accident (besides the *weakness* of the *Soil*, *Seed*, or *Root*, and the *injury* of the *Weather*) coming either of their *overgrowing* with *Moss*, or their being *hide bound*, or their *planting* too deep, or by *issuing* of the *Sap* too much into the *Leaves*: For all these there are *remedies* mentioned before.

Experiments
in Confort,
touching
Compound
Fruits and
Flowers.

WE see that in *Living Creatures* that have *Male* and *Female*, there is *copulation* of several kinds, and so *Compound Creatures*; as the *Mule*, that is generated betwixt the *Horse* and *Ass*, and some other *Compounds* which we call *Monsters*, though more rare: And it is held that that *Proverb*, *Africa semper aliquid Monstri parit*, cometh, for that the *Fountains* of *Waters* there being rare, divers sorts of *Beasts* come from several parts to drink, and so being refreshed fall to couple, and many times with several kinds. The *compounding* or *mixture* of *Kinds* in *Plants* is not found out, which nevertheless, if it be possible is more at command than that of *Living Creatures*, for that their lust requireth a voluntary motion; wherefore it were one of the most noble *Experiments* touching *Plants*, to find it out, for so you may have great variety of new *Fruits*, and *Flowers* yet unknown. *Grafting* doth it not, that mendeth the *Fruits* or doubleth the *Flowers*, &c. But it hath not the power to make a new kind. For the *Cions* ever over-ruleth the *Stock*.

477.

It hath been set down by one of the *Ancients*, That if you take two *Twigs* of several *Fruit-trees*, and flat them on the sides, and then bind them close together, and set them in the ground, they will come up in one *Stock*; but yet they will put forth in their several *Fruits* without any *commixture* in the *Fruit*. Wherein note (by the way) that *Unity of Continuance*, is easier to procure, than *Unity of Species*. It is reported also, That *Vines* of *Red* and *White Grapes*, being set in the *Ground*, and the upper parts being flatted, and bound close together, will put forth *Grapes* of the several colours, upon the same *Branch*; and *Grape stones* of several colours within the same *Grape*: But the more, after a year or two, the unity (as it seemeth) growing more perfect. And this will likewise help it from the

the first *uniting*, they be often watred: for all moisture helpeth to *Union*. And it is prescribed also to bind the *Bud*, as soon as it cometh forth, as well as the *Stock*, at the least for a time.

They report, that divers *Seeds* put into a *Clout*, and laid in Earth well dunged, will put up *Plants contiguous*; which (afterwards) being bound in their *Shoots* will *incorporate*. The like is said of *Kernels* put into a *Bottle*, with a narrow mouth, filled with Earth.

It is reported, that young *Trees* of several kinds set contiguous without any binding, and very often watred in a *fruitful ground*, with the very luxury of the *Trees* incorporate and grow together. Which seemeth to me the likeliest means that hath been propounded; for that the *binding* doth hinder the natural swelling of the *Tree*, which, while it is in motion, doth better *unite*.

478.

479.

Experiments
i. Consort
touching the
Sympathy and
Antipathy of
Plants.

THere are many ancient and received Traditions and Observations, touching the *Sympathy* and *Antipathy* of *Plants*; for that some will thrive best growing near others, which they impute to *Sympathy*; and some worse, which they impute to *Antipathy*. But these are idle and ignorant conceits, and forsake the true *indication* of the *causes*; as the most part of *Experiments*, that concern *Sympathies* and *Antipathies* do. For as to *Plants*, neither is there any such secret *Friendship*, or *Hatred*, as they imagine. And if we should be content to call it *Sympathy* and *Antipathy*, it is utterly mistaken; for their *Sympathy* is an *Antipathy*, and their *Antipathy* is a *Sympathy*: For it is thus, wheresoever one *Plant* draweth such a particular *Juyce* out of the Earth, as it qualifyeth the Earth, so as that *Juyce* which remaineth is fit for the other *Plant*, there the Neighborhood doth good, because the nourishments are contrary, or several: But where two *Plants* draw (much) the same *Juyce*, there the Neighborhood hurteth; for the one deceiveth the other.

First, therefore, all *Plants* that do draw much *nourishment* from the Earth, and so soak the Earth, and exhaust it, hurt all things that grow by them; as great *Trees*, (especially *Ashes*) and such *Trees*, as spread their *Roots* near the top of the ground. So the *Colewort* is not an enemy (though that were anciently received) to the *Vine* onely; but it is an enemy to any other *Plant*, because it draweth strongly the fattest *Juyce* of the Earth. And if it be true, that the *Vine*, when it creepeth near the *Colewort*, will turn way: This may be, because there it findeth worse nourishment; for though the *Root* be where it was, yet (I doubt) the *Plant* will bend as it nourisheth.

480.

Where *Plants* are of several Natures, and draw several *Juyces* out of the Earth, there (as hath been said) the one set by the other helpeth: As it is set down by divers of the Ancients, that *Rew* doth prosper much, and becometh stronger, if it be set by a *Fig-tree*: Which (we conceive) is caused not by reason of *Friendship*, but by *Extraction* of a contrary *Juyce*; the one drawing *Juyce* fit to result sweet, the other bitter. So they have set down likewise, that a *Rose* set by *Garlike* is sweeter; which likewise may be, because the more Fetide *Juyce* of the Earth goeth into the *Garlick*, and the more oderate into the *Rose*.

481.

This we see manifestly, That there be certain *Corn-flowers* which come seldome or never in other places, unless they be set, but onely amongst

482.

Corn: As the *blew Bottle* a kind of *Yellow Mary-Gold*, *Wilde Poppy*, and *Fumitory*. Neither can this be by reason of the culture of the Ground, by Ploughing or Farrowing, as some *Herbs* and *Flowers* will grow, but in *Ditches* new cast, for if the *Ground* lye fallow and unsown, they will not come: So as it should seem to be the *Corn* that qualifieth the *Earth*, and prepareth it for their growth.

483. This observation if it holdeth (as it is very probable) is of great use, for the *Meliorating* of *Taste* in *Fruits*, and *Esculent Herbs*, and of the *scent* of *Flowers*. For I do not doubt, but if the *Fig-tree* do make the *Rew* more strong and bitter, (as the *Ancients* have noted) good store of *Rew* planted about the *Fig-tree*, will make the *Fig* more sweet. Now the *tastes* that do most offend in *Fruits*, and *Herbs*, and *Roots* are *bitter*, *harsh*, *sour*, and *watrish*, or *flashy*. It were good therefore to make the *Tryals* following.

484. Take *Wormwood* or *Rew*, and set it near *Lattice*, or *Coleflory*, or *Artichock*; and see whether the *Lattice*, or the *Coleflory*, &c. become not the sweeter.

485. Take a *Service-tree* or a *Cornelian-tree*, or an *Eldertree*, which we know have *Fruits* of *harsh* and binding *Juyce*, and set them near a *Vine* or *Fig-tree*, and see whether the *Grapes* or *Figs* will not be the sweeter.

486. Take *Cucumbers* or *Pumpions*, and set them (here and there) amongst *Musk-Melons*, and see whether the *Melons* will not be more winy, and better tasted. Set *Cucumbers* (likewise) amongst *Raddish*, and see whether the *Raddish* will not be made the more biting.

487. Take *Sorrel* and set it amongst *Rasps*, and see whether the *Rasps* will not be the sweeter.

488. Take *Common Bryar*, and set it amongst *Violets* or *Wall-flowers*, and see whether it will not make the *Violets* or *Wall-flowers* sweeter, and less earth in their smell. So set *Lattice* or *Cucumbers*, amongst *Rosemary* or *Bays*, and see whether the *Rosemary* or *Bays*, will not be the more oderate or aromatical.

489. Contrariwise, you must take heed how you set *Herbs* together that draw much the like *Juyce*. And therefore I think *Rosemary* will leese in sweetness, if it be set with *Lavender* or *Bays*, or the like. But yet, if you will correct the strength of an *Herb*, you shall do well to set other like *Herbs* by him, to take him down; and if you would set *Tansy* by *Angelica*, it may be the *Angelica* would be the weaker and fitter for mixture in perfume. And if you should set *Rew* by *Common Wormwood*, it may be, the *Wormwood* would turn to be liker *Roman Wormwood*.

490. This *Axiom* is of large extent; and therefore would be severed, and refined by *Tryal*. Neither must you expect to have a *Gross difference* by this kind of *Culture*, but onely *further perfection*.

491. *Tryal* would be also made in *Herbs*, *Poysonous*, and *Purgative*, whose ill quality (perhaps) may be discharged or attempted, by setting stronger *Poysons* or *Purgatives* by them.

492. It is reported, that the *Shrub* called *Our Ladies Seal*, (which is a kind of *Briony*) and *Coleworts*, set near together, one or both will die. The cause is, for that they be both great *Depredators* of the *Earth*, and one of them starveth the other. The like is said of a *Reed* and a *Brake*, both which are succulent; and therefore the one deceiveth the other. And the like of *Hemlock* and *Rew*, both which draw strong *Juyces*.

493. Some of the *Ancients*, and likewise divers of the *Modern Writers*, that have labored in *Natural Magick*, have noted a *Sympathy* between the *Sun*,
Moon,

Moon, and some principal *Stars*; and certain *Herbs*, and *Plants*. And so they have denominated some *Herbs Solar*, and some *Lunar*, and such like toys put into great words. It is manifest, that there are some *Flowers* that have respect to the *Sun* in two kinds; the one by opening and shutting, and the other by bowing and inclining the Head. For *Mary-golds*, *Tulippas*, *Pimpernel*, and indeed most *Flowers* do open or spread their Leavs abroad, when the *Sun* shineth serene and fair: And again, (in some part) close them, or gather them inward, either toward night, or when the Sky, is overcast. Of this, there needeth no such solemn Reason to be assigned, as to say, that they rejoyce at the presence of the *Sun*, and mourn at the absence thereof. For it is nothing else, but a little loading of the Leavs, and swelling them at the bottom, with the moisture of the Air; whereas the dry Air doth extend them. And they make it a piece of the wonder, That *Garden Claver* will hide the *Stalk*, when the *Sun* sheweth bright, which is nothing but a full expansion of the Leavs; for the bowing and inclining the Head, it is found in the great *Flower* of the *Sun*, in *Mary-golds*, *Wartwort*, *Mallow Flowers*, and others. The cause is somewhat more obscure than the former: But I take it to be no other, but that the part, against which the *Sun* beateth, waxeth more faint and flaccide in the *Stalk*, and thereby less able to support the *Flower*.

494.

What a little *Moisture* will do in *Vegetables*, even though they be dead, and severed from the Earth, appeareth well in the Experiment of *Juglers*. They take the *Beard* of an *Oat*, which (if you mark it well) is wreathed at the bottom, and one smooth entire straw at the top. They take onely the part that is wreathed, and cut off the other, leaving the *Beard* half the breadth of a finger in length, Then they make a little *Cross* of a Quill longways, of that part of the Quill which hath the *Pith*; and *Cross* ways of that piece of the Quill without *Pith*, the whole *Cross* being the breadth of a finger high: Then they prick the bottom where the *Pith* is and there into they put the *Oaten-Beard*, leaving half of it sticking forth of the Quill: then they take a little white Box of Wood to deceive men, as if somewhat in the Box did work the feat; in which, with a Pin, they make a little hole, enough to take the *Beard*, but not to let the *Cross* sink down, but to stick: Then likewise, by way of Imposture, they make a question: As, who is the fairest Woman in the company? or who hath a Glove or Card? and cause another to name divers persons; and upon every naming, they stick the *Cross* in the Box, having first put it towards their mouth, as if they charmed it, and the *Cross* stirreth not: but when they come to the person that they would take, as they hold the *Cross* to their Mouth, they touch the *Beard* with the tip of their Tongue, and wet it, and so stick the *Cross* in the Box, and then you shall see it turn finely and softly, three or four turns, which is caused by the untwining of the *Beard* by the moisture. You may see it more evidently, if you stick the *Cross* between your fingers, instead of the Box: And therefore you may see, that this Motion, which is effected by so little wet, is stronger than the closing or bending of the Head of a *Mary-gold*.

495.

It is reported by some, That the *Herb* called *Rosa-Solis* (whereof they make Strong-waters) will at the Noon-day, when the *Sun* shineth hot and bright, have a great Dew upon it. And therefore, that the right name is *Ros Solis*; which they impute to a delight and sympathy that it hath with the *Sun*. Men favour wonders. It were good first to be sure, That the Dew that is found upon is, be not the Dew of the Morning preserved, when

when the Dew of other *Herbs* is breathed away: For it hath a smooth and thick Leaf, that doth not discharge the Dew so soon as other *Herbs* that are more Spungy and Porous. And it may be Purslane, or some other Herb doth the like, and is not marked. But if it be so, that it hath more Dew at Noon than in the Morning, then sure it seemeth to be an exudation of the *Herb* it self. As Plums sweat when they are set into the Oven: For you will not (I hope) think, that it is like *Gideons Fleece* of *Wooll*, that the *Dew* should fall upon that, and no where else.

496.

It is certain, that the *Honey Dews* are found more upon *Oak Leaves*, than upon *Ash*, or *Beech*, or the like; But whether any cause be from the *Leaf* it self, to concoct the Dew; or whether it be onely that the *Leaf* is close and smooth (and therefore drinketh not in the Dew, but preserveth it) may be doubted. It would be well inquired, whether *Manna* the *Drug*, doth fall but upon certain *Herbs* or *Leaves* onely. *Flowers* that have deep *Sockets*, do gather in the bottom a kind of *Honey*; as *Honey-Suckles* (both the *Woodbine* and the *Trifoil*) *Lillies*, and the like. And in them certainly the *Flowers* beareth part with the *Dew*.

497.

The Experience is, That the *Froth*, which they call *Woodfare*, (being like a kind of Spittle) is found but upon certain *Herbs*, and those hot ones; as *Lavender*, *Lavender-cotten*, *Sage*, *Hissage*, &c. Of the cause of this enquire further, for it seemeth a secret. There falleth also *Mildew* upon *Corn*, and smutteth it: But it may be, that the same falleth also upon other *Herbs*, and is not observed.

498.

It were good, Tryal were made, whether the great consent between *Plants* and *Water*, which is a principal nourishment of them, will make an *Attraction* at *Distance*, and not at touch enely. Therefore take a *Vessel*, and in the middle of it make a false bottom of course Canvas; fill it with *Earth* above the Canvas, and let not the *Earth* be watred, then sow some good *Seeds* in that *Earth*: But under the Canvas, some half a foot in the bottom of the *Vessel*, lay a great *Sponge*, thorowly wet in *Water*, and let it lie so some ten days; and see whether the *Seeds* will sprout, and the *Earth* become more moist, and the *Sponge* more dry. The *Experiment* formerly mentioned of the *Cucumber*, creeping to the Pot of *Water*, is far stranger than this.

499.

Experiments
in Confort,
touching the
Making *Hechs*
and *Fruits* Me-
dicinable.

THe altering of the *Sent*, *Colour*, or *Taste* of *Fruit*, by *Infusion*, *Mixing*, or *Letting*, into the *Bark*, or *Root* of the *Tree* *Herb* or *Flower*, any *Coloured*, *Aromatical*, or *Medicinal Substance*, are but *fancies*. The cause is, for that those things have passed the period, and nourish not; and all alteration of *Vegetables*, in those qualities, must be by somewhat that is apt to go into the nourishment of the *Plant*. But this is true; that where *Kine* feed upon *Wilde Garlick*, their *Milk* tasteth plainly of the *Garlick*. And the *Flesh* of *Muttons* is better tasted where the *Sheep* feed upon *Wilde Thime*, and other wholesome *Herbs*. *Galen* also speaketh of the curing of the *Scirrus* of the *Liver*, by *Milk* of a *Cow*, that feedeth but upon certain *Herbs*; and *Honey* in *Spain* smelleth (apparently) of the *Rosemary*, or *Orenge*, from whence the *Bee* gathers it: And there is an old Tradition of a *Maiden* that was fed with *Napellus*, (which is counted the strongest poyson of all *Vegetables*) which with use, did not hurt the *Maid*; but poyson some that had carnal company with her. So it is observed by some, that there is a vertuous *Bezoar*, and another without vertue, which appear to the shew alike; but the vertuous is taken from the *Beast*, that feedeth upon the *Mountains*, where there

there are *Theriacal Herbs*; and that without vertue, from those that fed in the Valleys, where no such Herbs are. Thus far I am of opinion, that as steeped Wines and Beers are very *Medicinal*, and likewise Bread tempered with divers powders; so of Meat also, (as *Flesh, Fish, Milk, and Eggs*) that they may be made of great use for *Medicine* and *Diet*, if the *Beast, Fowl, or Fish*, be fed with a special kind of food, fit for the disease. It were a dangerous thing also for secret empoysonnements. But whether it may be applied unto *Plants* and *Herbs*, I doubt more, because the nourishment of them is a more common Juyce; which is hardly capable of any special quality until the *Plant* doth assimilate it.

But least our incredulity may prejudice any profitable operations in this kind (especially since many of the Ancients have set them down) we think good briefly to propound the four Means, which they have devised of making *Plants Medicinable*. The first is by *slitting* of the *Root* and *infusing* into it the *Medicine*, as *Hellebore, Opium, Scammony, Triacle, &c.* and then binding it up again. This seemeth to me the least probable, because the *Root* draweth immediately from the Earth, and so the nourishment is the more common and less qualified; and besides, it is a long time in going up ere it come to the *Fruit*. The second way is, to *perforate* the *Body* of the *Tree* and there to *infuse* the *Medicine*, which is somewhat better. For if any Vertue be received from the *Medicine*, it hath the less way, and the less time to go up. The third is, the *steeping* of the *Seed* or *Kernel* in some *Liquor* wherein the *Medicine* is *infused*; which I have little opinion of, because *Seed* (I doubt) will not draw the parts of the *matter* which have the *propriety*; but it will be far the more likely, if you mingle the *Medicine* with *Dung*, for that the *Seed*, naturally drawing the *moisture* of the *Dung*, may call in withal some of the *propriety*. The fourth is, the *Watring* of the *Plant* oft, with an *Infusion* of the *Medicine*. This in one respect may have more force than the rest, because the *Medication* is oft renewed, whereas the rest are applied, but at one time; and therefore the vertue may the sooner vanish. But still I doubt, that the *Root* is somewhat too stubborn to receive those fine *Impressions*; and besides (as I have said before) they have a great *Hill* to go up. I judge therefore the likeliest way to be the *Perforation* of the *Body* of the *Tree* in *several places, one above the other*, and the *Filling* of the *Holes* with *Dung mingled with the Medicine*. And the *Watring* of those *Lumps* of *Dung*, with *Squirts* of an *Infusion* of the *Medicine* in *dunged Water*, once in three or four days.

500.

[illegible]

200



NATURAL HISTORY;

Century V I.



Our Experiments we take care to be (as we have often said) either *Experimenta Fructifera*, or *Lucifera*; either of Use, or of Discovery: For we hate *Impostures*; and despise *Curiosities*. Yet because we must apply our selves somewhat to others, we will set down some *Curiosities* touching *Plants*.

Experiments
in Confort.
touching Cu-
riosities about
Fruits and
Plants.

It is a *Curiosity* to have several *Fruits* upon one *Tree*; and the more, when some of them come *early*, and some come *late*: So that you may have, upon the same *Tree*, ripe *Fruits* all Summer. This is easily done by grafting off several *Cions* upon several Boughs of a Stock, in a good ground plentifully fed. So you may have all kinds of *Cherries*, and all kinds of *Plumbs*, and *Peaches*, and *Apricots*, upon one *Tree*: But, I conceive the *Diversity* of *Fruits* must be such, as will graft upon the same Stock. And therefore, I doubt, whether you can have *Apples*, or *Pears*, or *Orenges*, upon the same Stock, upon which you graft *Plumbs*.

501.

It is a *Curiosity* to have *Fruits* of divers *Shapes* and *Figures*. This is easily performed by Moulding them, when the *Fruit* is young, with Moulds of Earth or Wood. So you may have *Cucumbers*, &c. as long as a Cane, or as round as a Sphere, or formed like a Cross. You may have also *Apples* in the form of *Pears* or *Lemmons*. You may have also *Fruit* in more accurate *Figures*; as we said of *Men*, *Beasts*, or *Birds*, according as you make the Moulds, wherein you must understand, that you make the Mould big enough to contain the whole *Fruit*, when it is grown to the greatest; for else you will choak the spreading of the *Fruit*, which otherwise would spread it self, and fill the Concave, and so be turned into the shape desired; as it is in Mould-works of Liquid things. Some doubt may be con-

502.

ceived,

ceived, that the keeping of the Sun from the *Fruit*, may hurt it : But there is ordinary experience of *Fruit* that groweth covered. *Quere* also, whether some small holes may not be made in the Wood to let in the Sun. And note, that it were best to make the Moulds partible, glued, or cemented together, that you may open them when you take out the *Fruit*.

503. It is a *curiosity* to have *Inscriptions* or *Engravings*, in *Fruit* or *Trees*. This is easily performed, by *writing* with a *Needle*, or *Bodkin*, or *Knife*, or the like, when the *Fruit* or *Trees* are young; for as they grow, so the *Letters* will grow more large, and graphical.

——— *Tenerisque meos incidere Amores
Arboribus, crescent illa, crescetis Amores.*

504. You may have *Trees* apparelled with *Flowers* or *Herbs* by boring holes in the *Bodies* of them, and putting into them *Earth* holpen with *Muck*, and setting *Seeds* or *Slips*, of *Violets*, *Strawberries*, *WildeTime*, *Camomil*, and such like in the *Earth*, wherein they do but grow in the *Tree*, as they do in *Pots* though (perhaps) with some feeding from the *Trees*. As it would be tryed also with *shoots* of *Vines*, and *Roots* of *Red Roses*; for it may be they being of a more *Ligneous* Nature, will incorporate with the *Tree* it self.

505. It is an ordinary *curiosity* to form *Trees* and *Shrubs* (as *Rosemary*, *Juniper*, and the like) into *fundry* shapes; which is done by moulding them within, and cutting them without, but they are but lame things, being too small to keep *Figure*; great *Castles* made of *Trees* upon *Frames* of *Timber*, with *Turrets* and *Arches*, were anciently matters of magnificence.

506. Amongst *curiosities*, I shall place *Colouration*, though it be somewhat better; for *Beauty* in *Flowers* is their pre-eminence. It is observed by some that *Gilly-flowers*, *Sweet-Williams*, *Violets*, that are coloured, if they be neglected, and neither Watered, nor new Moulded, nor Transplanted, will turn *White*. And it is probable, that the *white*, with much culture, may turn coloured; for this is certain, That the *white* colour cometh of scarcity of Nourishment; except in *Flowers* that are onely *white*, and admit no other colours.

507. It is good therefore to see what *Natures* do accompany what colours; for by that you shall have light, how to induce colours; by producing those *Natures*. *Whites* are more inoderate (for the most part) than *Flowers* of the same kind coloured; as is found in single *White Violets*, *White Roses*, *White Gilly-Flowers*, *White Stock Gilly-Flowers*, &c. We find also, that *Blossoms* of *Trees*, that are *White*, are commonly inoderate; as *Cherries*, *Pears*, *Plumbs*, whereas those of *Apples*, *Crabs*, *Almonds*, and *Peaches*, are blusky, and smell sweet. The cause is, for that the substance that maketh the *Flower*, is of the thinnest and finest of the *Plant*, which also maketh *Flowers* to be of so dainty Colours. And if, it be too sparing and thin, it attaineth no strength of odor, except it be in such *Plants* as are very succulent; whereby they need rather to be scantied in their nourishment, than replenished, to have them sweet. As we see in *White Satyrion*, which is of a dainty smell; and in *Bean-Flowers*, &c. And again, if the *Plant* be of Nature to put forth *White-Flowers* onely, and those not thin or dry, they are commonly of rank and fullsome smell; as *May-Flowers* and *White-Lillies*.

508. Contrariwise, in *Berries*, the *White* is commonly more delicate and sweet in taste, than the Coloured; as we see in *White Grapes*, in *White Raspes*, in *white Strawberries*, in *White Currans*, &c. The cause is for that the

the coloured are more juyced, and courser juyced; and therefore not so well and equally concocted, but the *white* are better proportioned to the digestion of the Plant.

But in *Fruits*, the *white* commonly is meaner, as in *Pear-plumbs*, *Damosins*, &c. and the choicest *Plumbs* are black; the *Mulberry*, (which though they call it a *Berry*, is a *Fruit*) is better the *Black*, than the *White*. The *Harvest White-Plumb*, is a base *Plumb*, and the *Verdoccio* and *White Date-Plumb*, are no very good *Plumbs*. The cause is, for that they are all over-watry: Whereas an higher Concoction is required for sweetness, or pleasure of taste; and therefore all your dainty *Plumbs*, are a little dry, and come from the Stone; as the *Musk-Plumb*, the *Damosin-Plumb*, the *Peach*, the *Apricot*, &c. Yet some *Fruits* which grow not to be *Black*, are of the Nature of *Berries*, sweetest such as are paler, as the *Cœur-Cherry*, which inclineth more to *White*, is sweeter than the *Red*; but the *Egriot* is more sowre.

Take *Gilliflowers Seed*, of one kind of *Gilliflowers* (as of the *Clove-Gilliflower* which is the most common) and sow it, and there will come up *Gilliflowers*, some of one colour, and some of another, casually, as the *Seed* meeteth with nourishment in the Earth: So that the *Gardiners* find, that they may have two or three *Roots* amongst an hundred that are rare, and of great price, as *Purple Carnation* of several stripes. The cause is (no doubt) that in *Earth*, though it be contiguous, and in one Bed, there are very several *Juyces*; and as the *Seed* doth casually meet with them, so it cometh forth. And it is noted especially, that those which do come up *Purple*, do always come up single; the *Juyce*, as it seemeth, not being able to suffice a succulent colour, and a double Leaf. This Experiment of several colours, coming up from one *Seed*, would be tryed also in *Larks-foot*, *Monk-hood*, *Poppy*, and *Hollyoak*.

Few *Fruits* are coloured *Red* within; the *Queen-Apple* is, and another *Apple*, called the *Rose-Apple*; *Mulberries* likewise, and *Grapes*, though most toward the skin. There is a *Peach* also, that hath a circle of *Red* towards the stone; and the *Egriot-Cherry* is somewhat *Red* within: But no *Pear*, nor *Warden*, nor *Plumb*, nor *Apricot*, although they have (many times) *Red* sides, are coloured *Red* within. The cause may be enquired.

The general colour of *Plants* is *Green*, which is a colour that no *Flower* is of. There is a *greenish Prime-Rose*, but it is pale, and scarce a *green*; the *Leaves* of some *Trees* turn a little *Murrey* or *Reddish*; and they be commonly young *Leaves* that do so; as it is in *Oaks* and *Vines*. And *Hassle-Leaves* rot into a *Yellow*; and some *Hollies* have part of their *Leaves* *Yellow*, that are (to all seeming) as fresh and shining as the *Green*. I suppose also, that *Yellow* is a less succulent colour than *Green*, and a degree nearer *White*. For it hath been noted, that those *Yellow Leaves* of *Holly*, stand ever toward the North or North-East. Some *Roots* are *Yellow*, as *Carrets*, and some *Plants*, *Blood-red*, *Stalk* and *Leaf*, and all; as *Amaranthus*. Some *Herbs* incline to *Purple* and *Red*; as a kind of *Sage* doth; and a kind of *Mint*, and *Rosa Solis*, &c. And some have *White Leaves*, as another kind of *Sage*, and another kind of *Mint*: But *Azure* and a fair *Purple* are never found in *Leaves*. This shews that *Flowers* are made of a refined *Juyce* of the Earth, and so are *Fruits*; but *Leaves* of a more course and common.

It is a curiosity also to make *Flowers* double, which effected by often removing them into new Earth; as on the contrary part, double *Flowers*, by

509.

510.

511.

512.

513.

by neglecting, and not removing, prove *single*. And the way to do it speedily, is to sow or set *seeds*, or *Slips* of *Flowers*; and as soon as they come up, to remove them into new ground that is good: Enquire also, whether *inoculating* of *Flowers*, (as *Stock-Gilliflowers*, *Roses*, *Musk Roses*, &c.) doth not make them *double*. There is a *Cherry-Tree* that hath *double Blossoms*, but that *Tree* beareth no *Fruit*; and, it may be, that the same means, which applied to the *Tree*, doth extreamly accelerate the Sap to rise and break forth, would make the *Tree* spend it self in *Flowers*, and those to become *double*, which were a great pleasure to see, especially in *Apple trees*, *Peach-trees*, and *Almond-Trees*, that have *Blossoms* *Blush* coloured.

514.

The making of *Fruits* without *Core* or *Stone*, is likewise a *curiosity*, and somewhat better; because whatsoever maketh them so, is like to make them more tender and delicate. If a *Cions* or *Shoot* fit to be set in the Ground, have the *Pith* finely taken forth (and not altogether, but some of it left, the better to save the life) it will bear a *Fruit* with little or no *Core* or *Stone*. And the like is said to be of dividing a *quick Tree* down to the Ground, and taking out the *Pith*, and then binding it up again.

515.

It is reported also, that a *Citron* grafted upon a *Quince* will have small or no *Seeds*; and it is very probable, that any *sowre Fruit* grafted upon a *Stock* that beareth a *sweeter Fruit*, may both make the *Fruit* sweeter, and more void of the harsh matter of *Kernels* or *Seeds*.

516.

It is reported, that not only the taking out of the *Pith*, but the stopping of the *Juyce* of the *Pith* from rising in the midst, and turning it to rise on the outside, will make the *Fruit* without *Core* or *Stone*; as if you should bore a *Tree* clean thorow, and put a wedge in. It is true, there is some affinity between the *Pith* and the *Kernel*, because they are both of a harsh substance, and both placed in the midst.

517.

It is reported, that *Trees watered* perpetually with *warm Water*, will make a *Fruit* with little or no *Core* or *Stone*. And the rule is general, That whatsoever will make a *wild Tree*, a *Garden Tree*, will make a *Garden Tree* to have less *Core* or *Stone*.

518.

Experiments
in Consort,
touching the
Degenerating
of Plants, and
of the Trans-
mutation of
them, one into
another.

THE Rule is certain, That *Plants* for want of Culture, degenerate to be baser in the same kind; and sometimes so far, as to change into another kind. 1. The *standing long*, and not being removed, maketh them degenerate. 2. *Drought*, unless the *Earth* of it self be moist, doth the like. 3. So doth removing into worse *Earth*, or forbearing to compost the *Earth*; as we see, that *Water Mint* turneth into *Field Mint*, and the *Colewort* into *Rape* by neglect, &c.

519.

Whatsoever *Fruit* useth to be set upon a *Root*, or a *Slip*, if it be sown, will degenerate; *Grapes* sown, *Figs*, *Almonds*, *Pomegranate Kernels* sown, make the *Fruits* degenerate, and become wild. And again, most of those *Fruits* that use to be grafted, if they be set of *Kernels*, or *Stones*, degenerate. It is true, that *Peaches* (as hath been touched before) do better upon *Stones* set, than upon grafting: And the rule of Exception should seem to be this; That whatsoever *Plant* requireth much moisture, prospereth better upon the *Stone* or *Kernel*, than upon the *Graft*. For the *Stock*, though it giveth a finer nourishment, yet it giveth a scantier, than the *Earth* at large.

520.

Seeds, if they be very old, and yet have strength enough to bring forth a *Plant*, make the *Plant* degenerate. And therefore skilful *Gardners* make tryal of the *Seeds*, before they buy them, whether they be good or no, by putting them

them into Water gently boiled; and if they be good, they will sprout within half an hour.

It is strange, which is reported, That *Basil* too much exposed to the *Sun*, doth turn into *Wild Time*: Although those two *Herbs* seem to have small Affinity; but *Basil* is almost the onely hot *Herb* that hath fat and succulent *Leaves*; which *Oyliness*, if it be drawn forth by the *Sun*, it is like it will make a very great change.

521.

There is an old Tradition, that *Boughs of Oak* put into the Earth, will put forth *Wilde Vines*; which if it be true, (no doubt) it is not the *Oak* that turneth in a *Vine*, but the *Oak Bough* putrifying, qualifieth the Earth to put forth a *Vine* of it self.

522.

It is not impossible, and I have heard it verified, that upon cutting down of an old *Timber-Tree*, the *Stub* hath put forth sometimes a *Tree* of another kind; as that *Beech* hath put forth *Birch*: which if it be true, the cause may be, for that the old *Stub* is too scant of Juice to put forth the former *Tree*, and therefore putteth forth a *Tree* of a smaller kind, that needeth less Nourishment.

523.

There is an opinion in the Countrey, That if the same *Ground* be oft sown with the *Grain* that grew upon it, it will, in the end, grow to be of a baser kind.

524.

It is certain, that in very *Sterile Tears*, *Corn* sown will grow to an other kind.

525.

*Grandia sæpe quibus mandavimus Hordea Sulcis,
Infelix Lolium, & steriles dominatur Avena.*

And generally it is a Rule, that *Plants* that are brought forth by *Culture*, as *Corn*, will sooner change into other Species, than those that come of themselves: For that *Culture* giveth but an Adventitious Nature, which is more easily put off.

This work of the *Transmutation of Plants*, one into another, is *inter Magnalia Naturæ*: For the *Transmutation of Species* is, in the vulgar Philosophy pronounced impossible: And certainly, it is a thing of difficulty, and requir-eth deep search in Nature: But seeing there appear some manifest instances of it, the opinion of Impossibility is to be rejected, and the means thereof to be found out. We see that in *Living Creatures*, that come of *Putrefaction*, there is much *Transmutation* of one into another. As *Caterpillars* turn into *Flies*, &c. And it should seem probable, that whatsoever *Creature* having life, is generated without *Seed*, that *Creature* will change out of one species into another; for it is the *Seed*, and the Nature of it, which locketh and boundeth in the *Creature*, that it doth not expatiate. So as we may well conclude, that seeing the Earth of it self, doth put forth *Plants* without *Seed*, therefore *Plants* may well have a *Transmigration of Species*. Wherefore wanting *Instances*, which do occur, we shall give Directions of the most likely tryals: And generally, we would not have those that read this our work of *Sylva Sylvarum*, account it strange, or think that it is an over-haste, that we have set down particulars untried: For contrariwise, in our own estimation, we account such particulars more worthy than those that are already tryed and known. For these latter must be taken as you find them, but the other do level point blank at the inventing of causes, and Axioms.

526. First, therefore you must make an account, that if you will have one *Plant*; change into another, you must have the *Nourishment* over-rule the *Seed*. And therefore you are to practice it by *Nourishments*, as contrary as may be, to the *Nature* of the *Herb*; so nevertheless as the *Herb* may grow; and likewise with *Seeds* that are of the weakest sort, and have least vigor. You shall do well therefore to take *Marsh-Herbs*, and plant them upon tops of *Hills* and *Champaigns*; and such *Plants* as require much moisture, upon *Sandy* and very dry grounds. As for example, *Marsh-Mallows*, and *Sedge* upon *Hills*; *Cucumber* and *Lettuce-Seed*, and *Coleworts* upon a *Sandy Plat*; so contrariwise plant *Bushes*, *Heath*, *Ling*, and *Brakes* upon a *Wet* or *Marsh Ground*. This I conceive also, that all *Esculent* and *Garden-Herbs*, set upon the tops of *Hills*, will prove more *Medicinal*, though less *Esculent*, than they were before. And it may be likewise, some *Wilde-Herbs* you may make *Salut-Herbs*. This is the first Rule for *Transmutation* of *Plants*.
527. The second Rule shall be to bury some few *Seeds* of the *Herb* you would change amongst other *Seeds*; and then you shall see whether the *Juyce* of those other *Seeds* do not so qualifie the *Earth*, as it will alter the *Seed* whereupon you work. As for example, put *Parshy-seed* amongst *Onion-seed*, or *Lettuce-seed* amongst *Parshy-seed*, or *Basil-seed* amongst *Thyme-seed*, and see the change of taste or otherwise. But you shall do well to put the *Seed* you would change into a little *Linnen Cloth*, that it mingle not with the *Forreign Seed*.
528. The third Rule shall be the making of some meddly, or mixture of *Earth*, with some other *Plants* bruised, or shaven, either in *Leaf* or *Root*: As for example, make *Earth*, with a mixture of *Colewort-Leaves* stamped, and set in it *Artichokes*, or *Parsnips*: So take *Earth* made with *Majoram*, or *Origanum*, or *Wilde-Time*, bruised or stamped, and set in it *Fennel-seed*, &c. In which operation, the *Process* of *Nature* still will be, (as I conceive,) not that the *Herb* you work upon, should draw the *Juyce* of the *Forreign Herbs*; (for that opinion we have formerly rejected) but that there will be a new confection of mould, which perhaps will alter the *Seed*, and yet not to the kind of the former *Herb*.
529. The fourth Rule shall be to mark what *Herbs* some *Earths* do put forth of themselves, and to take that *Earth*, and to *Pot* it, or to *Vessel* it; and in to that, set the *Seed* you would change: As for Example, take from under *Walls*, or the like; where *Nettles* put forth in abundance, the *Earth* which you shall there find, without any *String* or *Root* of the *Nettles*; and pot that *Earth*, and set in it *Stock-Gilly-Flowers*, or *Wall-flowers*, &c. Or sow in the *Seeds* of them, and see what the event will be; or take *Earth*, that you have prepared to put forth *Mushromes* of it self, (whereof you shall find some instances following,) and sow it in *Purslane-seed*, or *Lettuce-seed*; for in these *Experiments*, it is likely enough, that the *Earth*, being accustomed to send forth one kind of *Nourishment*, will alter the new *Seed*.
530. The fifth Rule shall be, to make the *Herb* grow contrary to his nature, as to make *Ground Herbs* rise in height: As for example, carry *Camomile*, or *Wilde Thyme*, or the *Green Strawberry*, upon sticks, as you do *Hops* upon *Poles*, and see what the event will be.
531. The sixth Rule shall be to make *Plants* grow out of the *Sun*, or open *Air*; for that is a great mutation in *Nature*, and may induce a change in the *Seed*: As barrel up *Earth*, and sow some *Seed* in it, and put it in the bottom of a *Pond*, or put it in some great hollow *Tree*; try also the sowing of

of *Seeds* in the bottomes of Caves; and Pots with *Seeds* sown, hanged up in Wells, some distance from the Water, and see what the event will be.

IT is certain, that *Timber-Trees* in *Coppice Woods*, grow more upright, and more free from under Boughs, than those that stand in the *Fields*. The Cause whereof is, for that *Plants* have a natural motion to get to the Sun; and besides, they are not glutted with too much nourishment; for that the *Coppice* shareth with them, and Repletion ever hindreth stature. Lastly, they are kept warm, and that ever in *Plants* helpeth mounting.

Trees that are of themselves full of *Heat*, (which *Heat* appeareth by their *Inflamable Gums*) as *Firrs*, and *Pines*, mount of themselves in height without Side-boughs, till they come towards the top. The Cause is partly heat, and partly tenuity of *Juyce*; both which send the Sap upwards. As for *Juniper*, it is but a *Shrub*, and groweth not big enough in Body to maintain a tall *Tree*.

It is reported, that a good strong *Canvas*, spread over a *Tree* grafted low, soon after it putteth forth, will *Dwarf* it, and make it spread. The Cause is plain; for that all things that grow, will grow as they find room.

Trees are generally set of *Roots* or *Kernels*; but if you set them of *Slips*, (as of some *Trees* you may, by name the *Mulberry*) some of the *Slips* will take; and those that take (as is reported) will be *Dwarf-trees*. The Cause is, for that a *Slip* draweth nourishment more weakly, than either a *Root* or *Kernel*.

All *Plants* that put forth their *Sap* hastily, have their Bodies not proportionable to their length, and therefore they are *Winders* and *Creepers*; as *Ivy*, *Briony*, *Hops*, *Woodbine*; whereas *Dwarfing* requireth a slow putting forth, and less vigor of mounting.

THe *Scripture* saith, That *Solomon* wrote a *Natural History*, from the *Cedar of Libanus*, to the *Moss* growing upon the *Wall*; for so the best *Translations* have it. And it is true, that *Moss* is but the *Rudiment* of a *Plant*, and as it were the *Mould* of *Earth* or *Bark*.

Moss groweth chiefly upon *Ridges* of *Houses*, tiled or thatched, and upon the *Crests* of *Walls*, and that *Moss* is of a lightsome and pleasant Green. The growing upon *Slopes* is caused, for that *Moss*, as on the one side it cometh of *Moisture* and *Water*, so on the other side the *Water* must but slide, and not stand or pool. And the *Growing* upon *Tiles*, or *Walls*, &c. is caused, for that those dried *Earths*, having not moisture sufficient to put forth a *Plant*, do practice *Germination* by putting forth *Moss*; though when by age, or otherwise, they grow to relent and resolve, they sometimes put forth *Plants*, as *Wall-flowers*. And almost all *Moss* hath here and there little *Stalks*; besides the low *Thrum*.

Moss groweth upon *Alleys*, especially such as lye cold, and upon the North; as in divers *Tarrases*. And again, if they be much troden; or if they were at the first gravelled; For wheresoever *Plants* are kept down, the *Earth* putteth forth *Moss*.

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Experiments
in consort,
touching the
Procerity, and
Lowness, and
Artificial
Dwarfing of
Trees.

533.

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Experiments
in Consort,
touching the
Rudiments of
Plants, and of
the Excrescen-
ces of Plants,
or Super-
Plants.

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539. Old Ground, that hath been long unbroken up, gathereth Moss; and therefore Husbandmen use to cure their Pasture Grounds, when they grow to Moss, by Tilling them for a year, or two: Which also dependeth upon the same cause: for that the more sparing and starving Juyce the Earth, insufficient for Plants, doth breed Moss.

540. Old Trees are more Mossy, (far) than Young; for that the Sap is not so frank as to rise all to the Boughs, but tireth by the way, and putteth out Moss.

541. Fountains have Moss growing upon the Ground about them;
Muscoti Fontes ———

The cause is, for that the Fountains drain the Water from the Ground adjacent, and leave but sufficient moisture to breed Moss; and besides, the coldness of the Water conduceth to the same.

542. The Moss of Trees is a kind of Hair; for it is the Juyce of the Tree that is excerned, and doth not assimilate, and upon great Trees the Moss gathereth a figure, like a Leaf.

543. The moister sort of Trees yield little Moss, as we see in Asps, Poplars, Willows, Beeches, &c. Which is partly caused for the reason that hath been given of the frank putting up of the Sap into the Boughs; and partly for that the Barks of those Trees are more close and smooth, than those of Oakes, and Ashes, whereby the Moss can the hardlier issue out.

544. In Clay Grounds, all Fruit-trees grow full of Moss, both upon Body and Boughs; which is caused, partly by the coldness of the Ground, whereby the Plants nourish less, and partly by the toughness of the Earth, whereby the Sap is shut in, and cannot get up, to spread so frankly as it should do.

545. We have said heretofore, that if Trees be hide-bound, they wax less fruitful and gather Moss; and that they are holpen by hacking &c. And therefore by the reason of contraries, if Trees be bound in with Cords or some outward Bands they will put forth more Moss: Which (I think) happeneth to Trees that stand bleak, and upon the cold Wind. It would also be tryed, whether, if you cover a Tree somewhat thick upon the top, after his powling, it will not gather more Moss. I think also, the Watring of Trees with cold Fountain Water will make them grow full of Moss.

546. There is a Moss the Perfumers have, which cometh out of Apple-trees, that hath an excellent sent. Quere, particularly for the manner of the growth, and the nature of it. And for this Experiments sake, being a thing of price, I have set down the last Experiments, how to multiply and call on Mosses.

Next unto Moss I will speak of Mushromes, which are likewise an imperfect Plant. These Mushromes have two strange properties: the one, that they yield so delicious a Meat; the other, that they come up so hastily as in a night, and yet they are unsown. And therefore such as are Upstarts in State, they call in reproach, Mushromes. It must needs be therefore, that they be made of much moisture; and that moisture fat, gross, and yet somewhat concocted. And (indeed) we find, that Mushromes cause the accident, which we call Incubus; or the Mare in the Stomack. And therefore the Surfeit of them may suffocate and empoysom. And this sheweth, that they are windy; and that windiness is gross, and swelling; not sharp or griping. And upon the same reason Mushromes are a venereous Meat.

It is reported, that the *Bark* of *White* or *Red Poplar*, (which are of the moistest of *Trees*) cut small, and cast into *Furrows* well dunged, will cause the ground to put forth *Mushromes*, at all *Seasons* of the year fit to be eaten, some add to the mixture *Leaven of Bread* resolved in *Water*.

It is reported, that if a *Hilly-field*, where the *stubble* is standing, be set on fire, in a *showry season*, it will put forth great store of *Mushromes*.

It is reported, that *Harts-Horn* shaken, or in small pieces, mixed with *Dung* and *matred*, putteth up *Mushromes*. And we know that *Harts-Horn* is of a fat and clammy substance: And it may be *Ox-Horn* would do the like.

It hath been reported, though it be scarce credible, that *Ivy* hath grown out of a *Stags-Horn*; which they suppose did rather come from a *confrication* of the *Horn* upon the *Ivy*, than from the *Horn* it self. There is not known any substance, but *Earth*, and the *Precedures* of *Earth*, (as *Tile*, *Stone*, &c.) that yieldeth any *Moss*, or *Herby Substance*. There may be trial made of some *Seeds*, as that of *Fennel-Seed*, *Mustard-Seed*, and *Rape-Seed*, put into some little *holes* made in the *Horns* of *Stags*, or *Oxen*, to see if they will grow.

There is also another *unperfect Plant*, that (in shew) is like a great *Mushrome*? And it is sometimes as broad as ones *Hat*; which they call a *Toads-stool*; but it is not *Esculent*, and it groweth (commonly) by a dead *Stub* of a *Tree*, and likewise about the *Roots* of rotten *Trees*; and therefore seemeth to take his *Juyce* from *Wood* putrified. Which sheweth by the way, *Wood* putrified yieldeth a frank *moisture*.

There is a *Cake* that groweth upon the side of a dead *tree*, that hath gotten no name, but it is large and of a *Chestnut* colour, and hard and pithy; whereby it should seem, that even dead *trees* forget not their putting forth no more than the *Carcasses* of *Men Bodies*, that put forth *Hair* and *Nails* for a time.

There is a *Cod* or *Bag* that groweth commonly in the *Fields*; that at first is hard like a *Tennis-Ball*, and white; and after groweth of a *Mushrome* colour, and full of light *dust* upon the breaking; and is thought to be dangerous for the *eyes*, if the *Powder* get into them, and to be good for *Kibes*: Belike it hath a *Corrosive*, and *fretting Nature*.

There is an *Herb* called *Jewes-Ear*, that groweth upon the *Roots*, and lower parts of the *Bodies* of *Trees*, especially of *Elders*, and sometimes *Ashes*. It hath a strange property; for in *warm Water*, it swelleth, and openeth extreamly. It is not green, but of a dusky brown colour. And it is used for *squinancies* and *inflammations* in the *Throat*, whereby it seemeth to have a mollifying, and lenifying vertue.

There is a kind of *Spongy Excrecence*, which groweth chiefly upon the *Roots* of the *Lafer-Tree*, and sometimes upon *Cedar*, and other *Trees*. It is very white, and light, and fryable; which we call *Agarick*. It is famous in *Physick* for the purging of *tough Flegm*. And it is also an excellent opener for the *Liver*, but offensive to the *Stomach*; and in taste it is, at the first sweet and after bitter.

We find no *Super-Plant*, that is a formed *Plant*, but *Misselto*. They have an idle Tradition, that there is a *Bird* called a *Missel-Bird*, that feedeth upon a *Seed*, which many times she cannot digest, and so expelleth it whole with her excrement; which falling upon a *Bough* of a *Tree*, that hath some rift, putteth forth *Misselto*. But this is a *Fable*; for it is not probable, that *Birds* should feed upon that they cannot digest. But allow that,

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that, yet it cannot be for other Reasons: For first, it is found but upon certain *Trees*; and those *Trees* bear no such *Fruit*, as may allure that *Bird* to sit and feed upon them. It may be, that *Bird* feedeth upon the *Misseltoe-Berries*, and so is often found there; which may have given occasion to the tale. But that which maketh an end of the question is, that *Misseltoe* hath been found to put forth under the *Boughs*, and not (only) above the *Boughs*; so it cannot be any thing that falleth upon the *Bough*. *Misseltoe* groweth chiefly upon *Crab-trees*, *Apples-trees* sometimes upon *Hawes*, and rarely upon *Oaks*; the *Misseltoe* whereof is counted very *Medicinal*. It is ever green, Winter and Summer, and beareth a *white glistring Berry*; and it is a *Plant*, utterly differing from the *Plant*, upon which it groweth. Two things therefore may be certainly set down: First, that *superfetation* must be by *abundance* of *sap*, in the *Bough* that putteth it forth. Secondly that that *sap* must be such as the *Tree* doth excern, and cannot assimilate, for else it would go into a *Bough*; and besides, it seemeth to be more fat and unctuous than the ordinary *sap* of the *Trees*; both by the *Berry* which is clammy, and by that it continueth green Winter and Summer, which the *Tree* doth not.

557. This *Experiment* of *Misseltoe* may give light to other practices; therefore tryal would be made, by ripping off the *Bough* of a *Crab-tree* in the *Bark*, and *Watring* of the wound every day, with *warm water dugged*, to see if it would bring forth *Misseltoe*, or any such like thing. But it were yet more likely, to try it with some other *Watring* or *anointing*, that were not so natural to the *Tree* as *Water* is; as *Oyl*, or *Barm of Drink*, &c. So they be such things as kill not the *Bough*.

558. It were good to try, what *Plants* would put forth, if they be forbidden to put forth their *Natural Boughs*: Powl therefore a *Tree*, and cover it some thickness with *Clay* on the top, and see what it will put forth. I suppose it will put forth *Roots*; for so will a *Cions*, being turned down into *Clay*. Therefore in this *Experiment* also the tree would be closed with somewhat that is not so natural to the *Plant*, as *Clay* is; try it with *Leather*, or *Cloath*, or *Painting*, so it be not hurtful to the *Tree*. And it is certain, that a *Brake* hath been known to grow out of a *Pollard*.

559. A Man may count the *Prickles* of *Trees* to be a kind of *Excrecence*, for they will never be *Boughs*, nor bear *Leaves*. The *Plants* that have *Prickles*, are *Thorns*, *Black* and *White*; *Brjer*, *Rose*, *Lemmon-trees*, *Crab-trees*, *Goosberry*, *Berbery*; these have it in the *Bough*. The *Plants* that have *Prickles* in the *Leaf* are *Holly*, *Juniper*, *Whin-bush*, *Thistle*; *Nettles* also have a small venemous *Prickle*; so hath *Borrage*, but harmless. The cause must be, *Hasty putting forth*, want of *moisture*, and the *Closenefs* of the *Bark*. For the *Hast* of the *Spirit* to put forth, and the want of *Nourishment* to put forth a *Bough*, and the *closenefs* of the *Bark*, cause *Prickles* in *Boughs*; and therefore they are ever like a *Pyramis*, for that the *Moisture* spendeth after a little putting forth. And for *Prickles* in *Leaves*, they come also in putting forth more *Juyce* into the *Leaf*, than can spread in the *Leaf* smooth; therefore the *Leaves* otherwise are *Rough*, as *Burrage* and *Nettles* are. As for the *Leaves* of *Holly*, they are *Smooth*, but never *Plain*, but as it were with *Folds* for the same cause.

560. There be also *Plants*, that though they have no *Prickles*, yet they have a kind of *Downey* or *Velvet Rine* upon their *Leaves*; as *Rose-Campion*, *Stock-Gilliflowers*, *Colts-foot*; which *Down* or *Nap* cometh of a *subtile Spirit*, in a *soft* or *Fat substance*. For it is certain that both *Stock-Gillyflowers*, and *Rose-Campions*

Campions, stamped, have been applied (with success) to the *Wrests* of those that have had *Tertian* or *Quartan Agues*; and the *Vapor* of *Colts foot* hath a sanative vertue towards the *Lungs*, and the *Leaf* also is healing in *Surgery*.

Another kind of *Excrecence* is an *Exudation* of *Plants*, joyned with *Putrefaction*, as we see in *Oak Apples*, which are found chiefly upon the *Leaves* of *Oaks*, and the like upon *Willows*: And Country people have a kind of *Prediction*, that if the *Oak Apple*, broken, be full of *Worms* it is a sign of a *pestilent year*; which is a likely thing, because they grow of corruption.

There is also upon *Sweet*, or other *Bryer*, a fine *Tuft*, or *Brush* of *Moss* of divers colours; which if you cut, you shall ever find full of little white *Worms*.

It is certain, that *Earth* taken out of the *Foundations* of *Vaults*, and *Houses*, and *bottoms* of *Wells*, and then put into *Pots*, will put forth sundry kind of *Herbs*: But some time is required for the *Germination*; for if it be taken but from a *Fathom* deep, it will put forth the *first-year*, if much deeper, not till after a *year* or *two*.

The nature of the *Plants* growing out of *Earth* so taken up, doth follow the nature of the *Mould* it self, as if the *Mould* be soft and fine, it putteth forth soft *Herbs*; as *Grass*, *Plantine*, and the like: If the *Earth* be harder and courser, it putteth forth *Herbs* more rough, as *Thistles*, *Firs*, &c.

It is common *Experience*, that where *Alleys* are close gravelled, the *Earth* putteth forth the first year *Knot Grass*, and after *Spire Grass*. The cause is for that the hard *Gravel* or *Pebble*, at the first laying, will not suffer the *Grass* to come forth upright, but turneth it to find his way where it can; but after that the *Earth* is somewhat loosened at the top, the ordinary *Grass* cometh up.

It is reported, that *Earth* being taken out of *shady* and *watry Woods*, some depth, and potted, will put forth *Herbs* of a fat and juicy substance; as *Penny-wort*, *Purslane*, *Houfleeke*, *Penny-Royal*, &c.

The *Water* also doth send forth *Plants* that have no *Roots* fixed in the bottom: but they are less perfect *Plants*, being almost but *Leaves*, and those small ones: Such is that we call *Duck-weed*, which hath a *Leaf* no bigger then a *Thyme Leaf*, but of a fresher Green, and putteth forth a little string into the *Water*, far from the bottom. As for the *Water-Lilly*, it hath a *Root* in the *Ground*; and so have a number of other *Herbs* that grow in *Ponds*.

It is reported by some of the *Ancients*, and some *Modern Testimony* likewise, that there be some *Plants*, that grow upon the top of the *Sea*; being supposed to grow of some concretion of *Slime* from *Water*, where the *Sun* heateth hot, and where the *Sea* stirreth little. As for the *Alga Marina*, (*Sea-weed*) and *Eringium* (*Sea Thistle*) both have *Roots*; but the *Sea-weed* under the *Water*, the *Sea-Thistle* but upon the *Shore*.

The *Ancients* have noted, that there are some *Herbs* that grow out of *Snow*, laid up close together and putrified; and that they are all bitter, and they name one especially, *Flomus*, which we call *Moth-Mullein*. It is certain that *Worms* are found in *Snow* commonly, like *Earth-Worms*; and therefore it is not unlike, that it may likewise put forth *Plants*.

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562.

563.

Experiments in consort, touching the Producing of perfect Plants without Seeds.

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The *Ancients* have affirmed, that there are some *Herbs* that grow out of *Stone*; which may be, for that it is certain, that *Toads* have been found in the middle of a *Freestone*. We see also, that *Flints*, lying above ground, gather *Moss*; and *Wall-flowers*, and some other *Flowers* grow upon *Walls*. But whether upon the main *Brick* or *Stone*, or whether out of the *Lime*, or *Chinks*, is not well observed. For *Elders* and *Ashes* have been seen to grow out of *Steeple*s; but they manifestly grow out of *Clefts*, inasmuch as, when they grow big, they will disjoyn the *Stone*. And besides, it is doubtful, whether the *Mortar* it self putteth it forth, or whether some *Seeds* be not let fall by *Birds*. There be likewise *Rock-Herbs*, but, I suppose, those are, where there is some *Mould* or *Earth*. It hath likewise been found, that great *Trees*, growing upon *Quarries*, have put down their *Root* into the *Stone*.

571.

In some *Mines* in *Germany*, as is reported, there grow in the bottom *Vegetables*; and the *Workfolks* use to say, They have *Magical vertue*, and will not suffer men together them.

572.

The *Sea-sands* seldom bear *Plants*. Whereof the cause is yielded by some of the *Ancients*, for that the *Sun* exaleth the *Moisture*, before it can incorporate with the *Earth*, and yield a *Nourishment* for the *Plant*. And it is affirmed also, that *Sand* hath (always) his *Root* in *Clay*; and that there be no *Veins* of *Sand*, any great depth within the *Earth*.

573.

It is certain, that some *Plants* put forth for a time of their own *Store*, without any *Nourishment* from *Earth*, *Water*, *Stone*, &c. Of which, vide the *Experiment 29*.

574.
Experiments
in consort,
touching the
Foreign Plants.

It is reported, That *Earth*, that was brought out of the *Indies*, and other *remote Countries* for *Ballast* for *Ships*, cast upon some *Grounds* in *Italy*, did put forth *Forreign Herbs*, to us in *Europe* not known; and; that which is more, that of their *Roots*, *Barks*, and *Seeds*, confused together, and mingled with other *Earth*, and well watered with *warm Water*, there came forth *Herbs* much like the other.

575.

Plants, brought out of *hot Countries*, will endeavor to put forth at the same *time*, that they do usually do in their own *climate*; and therefore to preserve them, there is no more required than to keep them from the injury of putting back by *Cold*. It is reported also, that *Grain* out of the *hotter Countreys* translated into the *Colder*, will be more forward than the ordinary *Grain* of the *cold Country*. It is likely, that this will prove better in *Grains*, than in *Trees*; for that *Grains* are but *Annual*, and so the *vertue* of the *Seed* is not worn out; whereas in a *Tree*, it is embalmed by the *Ground*, to which it is removed.

576.

Many *Plants*, which grow in the *hotter Countreys*, being set in the *colder*, will nevertheless, even in those *cold Countreys*, being sown of *Seeds* late in the *Spring*, come up and abide most part of the *Summer*; as we find it in *Orenge*, and *Lemmon-Seeds*, &c. The *Seeds* whereof, sown in the end of *April*, will bring forth excellent *Sallets*, mingled with other *Herbs*. And I doubt not, but the *Seeds* of *Cloves-Trees*, and *Pepper-Seeds*, &c. If they could come hither *Green* enough to be sown, would do the like.

There

THere be some *Flowers, Blossoms, Grains, and Fruits*, which come more early, and others which come more late in the year. The *Flowers* that come early with us, are, *Prime-Roses, Violets, Anemonies, Water-Daffodillies, Crocus Vernus*, and some early *Tulippa's*, and they are all *Cold Plants*, which therefore (as it should seem) have a quicker Perception of the Heat of the *Sun* increasing, than the *Hot Herbs* have, as a *Cold hand* will sooner find a little warmth, than a hot. And those that come next after are *Wall-Flowers, Cowslips, Hyacinths, Rosemary-flowers, &c.* And after them *Pinks, Roses, Flower-deluces, &c.* And the latest are, *Gilly-flowers, Holly-Oaks, Larks-Foot, &c.* The earliest *Blossoms* are, the *Blossoms of Peaches, Almonds, Cornelians, Mezerions, &c.* And they are of such *Trees*, as have much moisture, either *Watry*, or *Oily*. And therefore *Crocus Vernus* also, being an *Herb* that hath an *Oily Juice*, putteth forth early. For those also find the *Sun* sooner than the *dryer Trees*. The *Grains* are, first, *Rye* and *Wheat*, then *Oats* and *Barley*, then *Pease* and *Beans*; for though *Green Pease* and *Beans* be eaten sooner, yet the *dry ones*, that are used for *Horse-meat*, are ripe last; and it seemeth, that the *fatter Grains* cometh first. The earliest *Fruits* are, *Strawberries, Cherries, Gooseberries, Corrans*; and after them *early Apples, early Pears, Apricots, Rasps*; and after them, *Damofins*, and most kind of *Plumbs, Peaches, &c.* And the latest are, *Apples, Wardens, Grapes, Nuts, Quinces, Almonds, Sloes, Brier-berries, Helps, Medlars, Services, Cornelians, &c.*

It is to be noted, That (commonly) *Trees* that ripen latest, blossom soonest; As *Peaches, Cornelians Sloes, Almonds, &c.* And it seemeth to be a work of providence that they blossom so soon, for otherwise they could not have the *Sun* long enough to ripen.

There be *Fruits* (but rarely) that come twice a year; as some *Pears, Strawberryes, &c.* And it seemeth, they are such as abound with nourishment, whereby after one period, before the *Sun* waxeth too weak, they can endure another. The *Violet* also, amongst *Flowers*, cometh twice a year, especially the *double white*; and that also is a *Plant* full of moisture. *Roses* come twice, but it is not without cutting, as hath been formerly said.

In *Muscovia*, though the *Corn* come not up till late *Spring*, yet their *Harvest* is as early as ours. The cause is, for that the strength of the *Ground* is kept in with the *Snow*; and we see with us, that if it be a long *Winter* it is commonly a more plentiful year. And after those kind of *Winters* likewise, the *Flowers* and *Corn* which are earlier and later, do come commonly at once, and at the same time; which troubleth the *Husbandman* many times; For you shall have *Red-Roses* and *Damask-Roses* come together, and likewise the *Harvest* of *Wheat* and *Barley*. But this hapneth ever, for that the earlier stayeth for the later, and not that the later cometh sooner.

There be divers *Fruit-trees*, in the *Hot countries*, which have *Blossoms*, and *Young fruit*, and *Ripe fruit*, almost all the year, succeeding one another. And it is said, the *Orange* hath the like with us, for a great part of *Summer*, and so also hath the *Fig*. And no doubt, the *Natural Motion* of *Plants* is to have so: But that either they want *Juice* to spend, or they meet with the *cold* of the *Winter*. And therefore this *Circle of ripening* cannot be, but in *succulent Plants*, and *hot countries*.

Some

577.
Experiments
in Consort,
touching the
Seasons in
which Plants
come forth,

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582.

Some Herbs are but *Annual*, and die, *Root* and all, once a year; as *Borridge*, *Lettuce*, *Cucumbers*, *Musk-melons*, *Basil*, *Tobacco*, *Mustard seed*, and all kinds of *Corn*; some continue many years, as *Hyssope*, *Germander*, *Lavender*, *Fennel*, &c. The cause of the *Dying* is double; the first is, the *tenderneſſ* and *Weakneſſ* of the *Seed*; which maketh the period in a small time; as it is in *Borridge*, *Lettuce*, *Cucumbers*, *Corn*, &c. And therefore none of these are hot. The other cause is, for that some Herbs can worse endure cold, as *Basil*, *Tobacco*, *Mustard-seed*; and these have (all) much heat.

583.

Experiments
in Confort,
touching the
Lasting of
Herbs and
Trees.

The *lasting* of *Plants*, is most in those that are *largest* of *Body*, as *Oaks*, *Elm*, *Chesnut*, the *Loat-tree*, &c. And this holdeth in *Trees*, but in *Herbs* it is often contrary, for *Borridge*, *Coleworts*, *Pompions*, which are Herbs of the *largest* size, are of *small* durance; whereas *Hyssope*, *Winter-Savory*, *Germander*, *Time*, *Sage*, will last long. The cause is, for that *Trees* last according to the *strength*, and *quantity* of their *Sap* and *Juyce*, being well munit by their *Bark*, against the injuries of the *Air*: But *Herbs* draw a weak *Juyce*, and have a soft *stalk*; and therefore those amongst them which last longest, are Herbs of *strong* smell, and with a *sticky* stalk.

584.

Trees that bear *Mast* and *Nuts*, are commonly more lasting than those that bear *Fruits*; especially the *moister* *Fruits*; as *Oaks*, *Beeches*, *Chesnuts*, *Walnuts*, *Almonds*, *Pine-trees*, &c. last longer than *Apples*, *Pears*, *Plumbs*, &c. The cause is, the *fatneſſ*, and *oylineſſ* of the *Sap*; which ever wasteth less, than the more *Watry*.

585.

Trees that bring forth their *Leaves* late in the year, and cast them likewise late, are more *lasting* than those that sprout their *Leaves* early, or shed them betimes. The cause is, for that the late coming forth, sheweth a *moisture* more fixed; and the other more loose, and more easily resolved. And the same cause is, that *Wild-trees* last longer than *Garden-trees*; and in the same kind, those whose *Fruit* is acide, more than those whose *Fruit* is sweet.

586.

Nothing procureth the *lasting* of *Trees*, *Bushes*, and *Herbs*, so much as often cutting; for every cutting causeth a renovation of the *Juyce* of the *Plant*: that it neither goeth so far, nor riseth so faintly, as when the *Plant* is not cut: Insomuch, as *Annual Plants*, if you cut them seasonably, and will spare the use of them, and suffer them to come up still young, will last more years than one, as hath been partly touched; such as is *Lettuce*, *Purflane*, *Cucumber*, and the like. And for great *Trees*, we see almost all *overgrown* *Trees* in Church yards, or near ancient Building, and the like, are *Pollards* or *Dottards*, and not *Trees* at their full height.

587.

Some Experiment would be made, how by *Art* to make *Plants* more *lasting* than their ordinary period; as to make a *stalk* of *Wheat*, &c. last a whole year. You must ever presuppose, that you handle it so, as the *Winter* killeth it not; for we speak only of *prolonging* the *Natural Period*. I conceive, that the *Rule* will hold, That whatsoever maketh the *Herb* come later than at his time, will make it last longer time: It were good to try it in a *stalk* of *Wheat*, &c. set in the shade, and encompassed with a case of *Wood*, not touching the *Straw*, to keep out open *Air*.

As for the Preservation of *Fruits*, and *Plants*, as well upon the *Tree* or *Stalk*, as gathered, we shall handle it under the Title of Conservation of *Bodies*.

588:

Experiments
in Consort
touching the
several Fi-
gures of
Plants.

THe *Particular Figures* of *Plants* we leave to their *descriptions*, but some few things in general, we will observe. *Trees* and *Herbs*, in the growing forth of their *Boughs* and *Branches* are not *figured*, and keep no order. The cause is, for that the *Sap*, being restrained in the *Rinde* and *Bark*, breaketh not forth at all, (as in the *Bodies* of *Trees* and *stalks* of *Herbs*) till they begin to branch, and then, when they make an eruption, they break forth casually, where they find best way in the *Bark* or *Rinde*. It is true, that some *Trees* are more scattered in their *Boughs*; as *Sallow-trees*, *Warden-trees*, *Quince-tree*, *Medlar-trees*, *Lemmon-trees*, &c. Some are more in the form of a *Pyramis*, and come almost to *rod*; as the *Pear-trees* (which the *Criticks* will have to borrow his name of *rod*, Fire) *Orange-trees*, *Firr-trees*, *Service-Trees*, *Lime-trees*, &c. And some are more spread and broad, as *Beeches*, *Horn-beam*, &c. The rest are more indifferent. The cause of scattering the *Boughs* is, the hasty breaking forth of the *Sap*; and therefore those *Trees* rise not in a *Body* of any height, but Branch near the *Ground*. The cause of the *Pyramis* is, the keeping in of the *Sap*, long before it branch, and the spending of it, when it beginneth to branch, by equal degrees: The spreading is caused, by the carrying up of the *Sap* plentifully, without expence, and then putting it forth speedily, and at once.

589.

There be divers *Herbs*, but no *Trees*, that may be said to have some kind of order, in the putting forth of their *Leaves*: For they have *Joints*, or *Knuckles*, as it were stops in their *Germination*; as have *Gilli-flowers*, *Pincks*, *Fennel Corn*, *Reeds*, and *Canes*. The cause whereof is, for that the *Sap* ascendeth unequally, and doth (as it were) tire and stop by the way. And it seemeth, they have some *closeness* and *hardness* in their *Stalk*, which hindreth the *Sap* from going up, until it hath gathered into a knot, and so is more urged to put forth. And therefore, they are most of them hollow, when the *Stalk* is dry; as *Fennel-Stalks*, *Stubble*, and *Canes*.

590.

Flowers have (all) exquisite *Figures*, and the *Flower numbers* are (chiefly) five and four; as in *Prime-Roses*, *Brier-Roses*, *single Musk-Roses*, *single Pincks*, and *Gilli-flowers*, &c. which have five *Leaves*: *Lillies*, *Flower-de-luces* *Borage*, *Bugloss*, &c. which have four *Leaves*. But some put forth *Leaves* not numbred, but they are ever small ones, as *Marigolds*, *Trifoile*, &c. We see also, that the *Sockets*, and *Supporters* of *Flowers*, are *Figured*; as in the five *Brethren* of the *Rose*, *Sockets* of *Gilli-flowers*, &c. *Leaves* also are all *Figured*, some round, some long, none square, and many jagged on the sides; which *Leaves* of *Flowers* seldom are. For, I account, the jagging of *Pincks*, and *Gilli-flowers*, to be like the inequality of *Oak-leaves*, of *Vine-leaves*, or the like; but they seldom or never have any small *Purls*.

591.

Experiments
in Consort
touching
Some principal
differences in
Plants.

OF *Plants* some few put forth their *Blossoms* before their *Leaves*; as *Almonds*, *Peaches*, *Cornelians*, *Black-Thorn*, &c. But most put forth some *Leaves* before their *Blossoms*, as *Apples*, *Pears*, *Plumbs*, *Cherries*, *White-Thorn*, &c. The cause is, for that those that put forth their *Blossoms* first, have either an acute and sharp spirit; (and therefore commonly they all put forth early in the Spring, and ripen very late, as most of the particulars before mentioned) or else an oily Juice, which is apter to put out *Flowers* than *Leaves*.

592.

Of *Plants* some are *Green* all *Winter*, others cast their *Leaves*. There are *Green* all *Winter*, *Holly*, *Ivy*, *Box*, *Firr*, *Eugh*, *Cypress*, *Juniper*, *Bays*, *Rosemary*, &c. The cause of the holding *Green*, is the close and compact substance

stance of their *Leaves* and the *Pedicles* of them. And the cause of that again, is, either the *tough* and *viscous* *Juice* of the *Plant*, or the *strength* and *Heat* thereof. Of the first sort is, *Holly*: which is of so *viscous* a *Juice*, as they make *Bird-lime* of the *Bark* of it. The *Stalk* of *Ivy* is *tough*, and not *fragile*, as we see it in other small *Twigs* dry. *Fir* yieldeth *Pitch*. *Box* is a fast and heavy *Wood*, as we see it in *Bowls*. *Eugh* is a strong and tough *Wood*, as we see it in *Bows*. Of the second sort, is *Juniper*, which is a *Wood* oderate, and maketh a hot *Fire*. *Bays* is likewise a hot and *aromatical* *Wood*, and so is *Rosemary* for a *Shrub*. As for the *Leaves*, their density appeareth in that, either they are smooth and shining, as in *Bays*, *Holly*, *Ivy*, *Box*, &c. or in that, they are hard and spiry, as in the rest. And tryal would be made of *Grafting* of *Rosemary* for *Bays*, and *Box*, upon a *Holly* *Stock*, because they are *Plants* that come all *Winter*. It were good to try it also with *Grafts* of other *Trees*, either *Fruit-trees*, or *Wild trees*, to see whether they will not yield their *Fruit*, or bear their *Leaves* later, and longer in the *Winter*; because the *Sap* of the *Holly* putteth forth most in the *Winter*. It may be also a *Mezerion-tree*, grafted upon a *Holly*, will prove both an earlier, and a greater *Tree*.

593.

There be some *Plants* that bear no *Flower*, and yet bear *Fruit*; there be some that bear *Flowers*, and no *Fruit*; there be some that bear neither *Flowers* nor *Fruit*. Most of the great *Timber-trees*, (as *Oaks*, *Beeches*, &c.) bear no apparent *Flowers*; some few (likewise) of the *Fruit-trees*, as *Mulberry*, *Walnuts*, &c. And some *Shrubs*, (as *Juniper*, *Holly*, &c.) bear no *Flowers*. Divers *Herbs* also bear *Seeds*, (which is as the *Fruit*), and yet bear no *flowers*, as *Purslane*, &c. Those that bear *Flowers* and no *Fruit*, are few, as the double *Cherry*, the *Sallow*, &c. But for the *Cherry*, it is doubtful, whether it be not by *Art* or *Culture*; for if it be by *Art*, then tryal would be made, whether *Apples* and other *Fruits* *Blossoms* may not be doubled. There are some few, that bear neither *Fruit*, nor *Flowers*; as the *Elm*, the *Poplars*, *Box*, *Barks*, &c.

594.

There be some *Plants* that shoot still upwards, and can support themselves; as the greatest part of *Trees* and *Plants*: There be some other, that creep along the *Ground*, or *Wind* about other *Trees*, or *Props*, and cannot support themselves; as *Vines*, *Ivy*, *Bryar*, *Bryony*, *VWoodbines*, *Hops*, *Climatis*, *Camomile*, &c. The cause is, (as hath been partly touched) for that all *Plants*, (naturally) move upwards; but if the *Sap* put up too fast, it maketh a slender *Stalk*, which will not support the weight; and therefore these latter sort are all swift and hasty comers.

595.

Experiments
in Confort
touching all
Manner of
Composts and
Help of
Ground.

THE first and most ordinary help is *Stercoration*. The *Sheeps-dung* is one of the best; and next, the *Dung* of *Kine*; and thirdly, that of *Horses*; which is held to be somewhat too hot, unless it be mingled; that of *Pigeons* for a *Garden*, or a small quantity of *Ground*, excelleth. The ordering of *Dung* is, if the *Ground* be *Arable*, to spread it immediately before the *Plowing* and *Sowing*, and so to *Plough* it in: For if you spread it long before, the *Sun* will draw out much of the *fatness* of the *Dung*: If the *Ground* be *Grazing*, to spread it somewhat late towards *Winter*, that the *Sun* may have the less power to dry it up. As for special *Composts* for *Gardens* (as a *Hot Bed* &c.) we have handled them before.

596.

The second kind of *Compost* is the spreading of divers kinds of *Earth* as *Marl*, *Chalk*, *Seasand*, *Earth* upon *Earth*, *Pond-Earth*, and the mixtures of them. *Marl* is thought to be the best, as having most *fatness*. And not heating

heating the *Ground* too much. The next is *Sea-sand*, which (no doubt) obtained a special vertue by the *Salt*; for *Salt* is the first rudiment of life. *Chalk* over-heateth the *Ground* a little; and therefore is best upon cold *Clay-Grounds*, or *Moist-Grounds*: But I heard a great *Husband* say, that it was a common error to think that *Chalk* helpeth *Arable Grounds*, but helpeth not *Grazing Grounds*, whereas (indeed) it helpeth *Grass* as well as *Corn*. But that which breedeth the error is, because after the *chalking* of the *Ground*, they wear it out with many *Crops* without rest; and then (indeed) afterwards it will bear little *Grass*; because the *Ground* is tired out. It were good to try the laying of *Chalk* upon *Arable Grounds*, a little while before *Ploughing*, and to *Plough* it in, as they do the *Dung*; but then it must be friable first, by *Rain* or *Lying*: As for *Earth* it *Compasseth* it self; for I knew a great *Garden*, that had a *Field* (in a manner) poured upon it, and it did bear *Fruit* excellently the first year of the *Planting*; for the *Surface* of the *Earth* is ever then fruitfulest: And *Earth* so prepared hath a double *Surface*. But it is true, as I conceive, that such *Earth* as hath *Salt-Peter* bred in it, if you can procure it without too much charge, doth excel. The way to hasten the *breeding* of *Salt-Peter*, is to forbid the *Sun*, and the growth of *Vegetables*. And therefore, if you make a large *Hovel*, thatched over some quantity of *Ground*; nay, if you do but plank the *Ground* over, it will breed *Salt-Peter*. As for *Pond-Earth* or *River-Earth*, it is a very good *compost*, especially, if the *Pond* have been long uncleaned, and so the *Water* be not too hungry; and I judge it will be yet better, if there be some *mixture* of *Chalk*.

The third *help* of *Ground* is, by some other *Substances* that have a vertue to make *Ground* Fertile, though they be not meerly *Earth*, wherein *Ashes* excel; insomuch as the countries about *Etna* and *Vesuvius* have a kind of amends made them, for the mischief the eruptions (many times) do, by the exceeding fruitfulness of the soyl, caused by the *Ashes* scattered about. *Soot* also, though thin, spread in a *Field* or *Garden*, is tryed to be a very good *compost*. For *Salt* it is too costly; but it is tried, that mingled with *Seed-corn*, and sown together, it doth good: And I am of opinion, that *Chalk* in *Powder*, mingled with *Seed corn*, would do good: perhaps as much as *Chalking* the *Ground* all over. As for the *steeping* of the *Seeds* in several *mixtures* with *Water*, to give them vigor, or *watring* *Grounds* with *Compost-water*, we have spoken of them before.

The fourth *help* of *Ground* is, the *suffering* of *Vegetables* to die into the *Ground*, and so to fatten it; as the *Stubble* of *Corn*, especially *Pease*. *Brakes* cast upon the *Ground* in the beginning of *Winter*, will make it very fruitful. It were good (also) to try whether *Leaves* of *Trees* swept together with some *Chalk* and *Dung* mixed, to give them more heart, would not make a good *Compost*: For there is nothing lost, so much as *Leaves* of *Trees*, and as they lie scattered, and without mixture, they rather make the *Ground* sowre, than otherwise.

The fifth *help* of *Ground* is, *Heat* and *Warmth*. It hath been anciently practised to burn *Heath*, and *Ling*, and *Sedge*, with the vantage of the *Wind*, upon the *Ground*. We see, that *Warmth* of *Walls* and *Inclosures*, mendeth *Ground*: we see also, that *lying open* to the *South*, mendeth *Ground*; we see again that the *Foldings* of *Sheep* help *Ground* as well by their *warmth* as by their *compost*: And it may be doubted, whether the *covering* of the *Ground* with *Brakes*, in the beginning of the *Winter* (whereof we spake in the last *Experiment*) helpeth it not, by reason of the *Warmth*. Nay, some very good

600.

Husbands do suspect, that the gathering up of *Flints* in *Flinty Ground*, and laying them on (*Heaps* which is much used) is no good *Husbandry* for that they would keep the *Ground* warm.

The sixth help of *Ground* is, by *Watring* and *Irrigation*; which is in two manners; The one by *Letting* in, and *Shutting* out *Waters*, at seasonable times; for *Water*, at some seasons, and with reasonable stay, doth good; but at some other seasons, and with too long stay, doth hurt. And this serveth onely for *Meadows*, which are along some *River*. The other way is to bring *Water* from some *hanging Grounds*, where there are *Spring*, into the *lower Ground*, carrying it in some long *Furrows*; and from those *Furrows*, drawing it traverse to spread the *Water*: And this maketh an excellent improvement, both for *Corn* and *Grass*. It is the richer, if those *hanging Grounds*, be fruitful, because it washeth off some of the fatness of the *Earth*; but howsoever it profiteth much. Generally where there are great overflows in *Fens*, or the like, the drowning of them in the *Winter*, maketh the *Summer* following more fruitful: The cause may be, for that it keepeth the *Ground* warm, and nourisheth it. But the *Fen-men* hold, that the *Sewers* must be kept so, as the *Water* may not stay too long in the *Spring* till the *Weeds* and *Sedge* be grown up; for then the *Ground* will be like a *Wood* which keepeth out the *Sun*, and so continueth the wet; whereby it will never graze (to purpose) that year. Thus much for *Irrigation*; but for *Avoidances*, and *Drainings* of *Water*, where there is too much, and the helps of *Ground* in that kind, we shall speak of them in another place.

NATURAL



NATURAL HISTORY;

Century VII.



The differences between *Animate* and *Inanimate Bodies*, we shall handle fully under the *Title of Life*, and *Living Spirits*, and *Powers*. We shall therefore make but a brief mention of them in this place. The main differences are two. All *Bodies* have *Spirits*, and *Pneumatical parts* within them; but the main differences between *Animate* and *Inanimate* are two. The first is, that the *Spirit of things animate*, are all continued with themselves, and are branched in *Veins* and secret *Canals*, as *Blood* is: And in *Living Creatures*, the *Spirits* have not only *Branches*, but certain *Sells* or *Seats*, where the principal *Spirits* do reside, and whereunto the rest do resort; But the *Spirits* in *things Inanimate* are shut in, and cut off by the *Tangible parts*; and are pervious one to another, as *Air* is in *Snow*. The second main difference is, that the *Spirits of Animate Bodies* are all in some degree (more or less) kindled and inflamed, and have a fine commixture of *Flame*, and an *Aerial substance*: But *Inanimate Bodies* have their *Spirits* no whit inflamed or kindled. And this difference consisteth not in the *Heat* or *Coolness* of *Spirits*; for *Cloves* and other *Spices*, *Naptha* and *Petroleum*, have exceeding *Hot Spirits* (hotter a great deal than *Oyl*, *Wax*, or *Tallow*; &c. but not inflamed. And when any of those weak, and temperate *Bodies* come to be inflamed than they gather a much greater *heat*, than others have *uninflamed*, besides their *light* and *motion*, &c.

The differences which are *secondary*, and proceed from these two radical differences are, first, *Plants* are all *figurate* and *determinate*, which *inanimate Bodies* are not, for look how far the *Spirit* is able to spread and continue it self, so far goeth the *shape* or *figure*; and then is *determined*. Secondly, *Plants* do nourish, *inanimate Bodies* do not; they have an *Accretion*, but no *Alimentation*. Thirdly, *Plants* have a period of life, which *inanimate Bodies* have not. Fourthly, they have a *succession* and *propagation* of their kind, which is not in *Bodies inanimate*.

M 3

The

601.

Experiments
in consort,
touching the
Affinities and
Differences
between *Plants*
and *Inanimate*
Bodies.

602.

603. The differences between *Plants*, and *Metals* or *Fossiles*, besides those four before mentioned, (for *Metals* I hold inanimate) are these: First, *Metals* are more durable than *Plants*: Secondly, they are more solid and hard: Thirdly, they are wholly *subterrany*; whereas *Plants* are part above *Earth* and part under *Earth*.

604. There be very few *Creatures* that participate of the Nature of *Plants*, and *Metals* both; *Coral* is one of the nearest of both kinds; another is *Vitriol*, for that is aptest to sprout with moisture.

605. Another special Affinity is between *Plants* and *Mould* or *Putrefaction*: For all *Putrefaction*, (if it dissolve not in *Arefaction*) will in the end issue into *Plants* or *Living Creatures* bred of *Putrefaction*. I account *Moss*, and *Mushromes*, and *Agarick*, and other of those kinds, to be but *Moulds* of the *Ground*, *Walls*, and *Trees*, and the like. As for *Flesh*, and *Fish*, and *Plants* themselves, and a number other things, after a *Mouldiness*, or *Rottiness*, or *Corrupting*, they will fall to breed *Worms*. These *Putrefactions*, which have Affinity with *Plants*, have this difference from them; that they have no succession or propagation, though they nourish, and have a period of *Life*, and have likewise some Figure.

606. I left once, by chance, a *Citron* cut in a close room, for three Summer months, that I was absent; and at my return, there were grown forth out of the Pith cut, Tufts of Hairs, an inch long, with little black Heads, as if they would have been some Herb.

607. Experiments in Consort, touching the Affinities and Differences of *Plants* and *Living Creatures*: And the Confines and Participles of them.

The Affinities and differences between *Plants* and *Living Creatures* are these that follow. They have both of them *Spirits* continued and branched, and also inflamed. But first in *Living Creatures* the *Spirits* have a Cell or Seat, which *Plants* have not, as was also formerly said. And secondly, the *Spirits* of *Living Creatures* hold more of *Flame*, than the *Spirits* of *Plants* do; and these two are the Radical differences. For the Secondary differences, they are as follow. First, *Plants* are all fixed to the *Earth*; whereas all *Living Creatures* are severed, and of themselves. Secondly, *Living Creatures* have Local Motion, *Plants* have not. Thirdly, *Living Creatures* nourish from their upper parts by the Mouth chiefly; *Plants* nourish from below, namely from the *Roots*. Fourthly, *Plants* have their Seed and Seminal parts uppermost, *Living Creatures* have them lowermost; and therefore it was said, not Elegantly alone, but Philosophically: *Homo est Planta inversa*. Man is like a Plant turned upwards; For the Root in *Plants*, is as the Head in *Living Creatures*. Fifthly, *Living Creatures* have a more exact Figure than *Plants*. Sixthly, *Living Creatures* have more diversity of Organs within their Bodies, and (as it were) inward Figures, than *Plants* have. Seventhly, *Living Creatures* have Sense, which *Plants* have not. Eighthly, *Living Creatures* have voluntary Motion, which *Plants* have not.

608. For the difference of Sexes in *Plants*, they are oftentimes by name distinguished as *Male-Piony*, *Female-Piony*; *Male-Rosemary*, *Female-Rosemary*; *He-Holly*, *She-Holly*, &c. But Generation by Copulation (certainly) extendeth not to *Plants*. The nearest approach of it, is between the *He-Palm*, and the *She-Palm*, which (as they report) if they grow near, incline the one to the other; insomuch as, (that which is more strange) they doubt not to report, that to keep the *Trees* upright from bending, they tie Ropes or Lines from the one to the other, that the contact might be enjoyed by the contact of a middle Body. But this may be feigned, or at least amplified. Nevertheless, I

am apt enough to think, that this same *Binarium* of a stronger and a weaker, like unto *Masculine* and *Feminine*, doth hold in all *Living Bodies*. It is confounded sometimes, as in some *Creatures* of *Putrefaction*, wherein no marks of distinction appear; and it is doubled sometimes, as in *Hermaphrodites*: but generally there is a degree of strength in most *Species*.

The *Participles* or *Confiners* between *Plants* and *Living Creatures*, are such chiefly as are *fixed*, and have no *Local Motion* of remove; though they have a *Motion* in their parts, such as are *Oysters*, *Cockles*, and such like. There is a fabulous Narration, That in the *Northern Countreys* there should be an *Herb* that groweth in the likeness of a *Lamb*, and feedeth upon the *Grass*, in such sort, as it will bare the *Grass* round about. But I suppose, that the *Figure* maketh the *Fable*; for so we see there be *Bee-flowers*, &c. And as for the *Grass*, it seemeth the *Plant*, having a great *stalk* and *top*, doth prey upon the *Grass* a good way about, by drawing the *Juyce* of the *Earth* from it.

609.

THe *Indian Fig* boweth his *Roots* down so low in one year, as of it self it taketh *Root* again; and so multiplieth from *Root* to *Root*, making of one *Tree* a kind of *Wood*. The cause is, the plenty of the *Sap*, and the softness of the *stalk*, which maketh the *Bough*, being over-loaden, and not stiffly upheld, weigh down. It hath *Leaves* as broad as a little *Target*, but the *Fruit* no bigger than *Beans*. The cause is, for that the continual shade increaseth the *Leaves*, and abateth the *Fruit*; which nevertheless is of a pleasant taste. And that (no doubt) is caused, by the suppleness and gentleness of the *Juyce* of that *Plant*, being that which maketh the *Boughs* also so flexible.

610.
Experiments
promiscuous
touching
Plants.

It is reported by one of the *Ancients*, that there is a certain *Indian Tree*, having few, but very great *Leaves*, three cubits long, and two broad; and that the *Fruit* being of good taste, groweth out of the *Bark*. It may be there be *Plants* that pour out the *sap* so fast, as they have no leasure, either to divide into many *Leaves*, or to put forth *Stalks* to the *Fruit*. With us *Trees* generally have small *Leaves* in comparison. The *Fig* hath the greatest, and next it the *Vine*, *Mulberry*, and *Sycamore*, and the least are those of the *Willow*, *Birch*, and *Thorn*. But there be found *Herbs* with far greater *Leaves* than any *Tree*; as the *Bur*, *Gourd*, *Cucumber*, and *Colewort*. The cause is, (like to that of the *Indian Fig*) the hasty and plentiful putting forth of the *Sap*.

611.

There be three things in use for sweetness, *Sugar*, *Honey*, *Manna*. For *Sugar*, to the *Ancients* it was scarce known, and little used. It is found in *Canes*; *Quere*, whether to the first *Knuckle*, or further up? and whether the very *Bark* of the *Cane* it self do yield *Sugar*, or no? For *Honey*, the *Bee* maketh it, or gathereth it; but I have heard from one, that was industrious in Husbandry, that the labour of the *Bee* is about the *Wax*, and that he hath known in the beginning of *May*, *Honey-Combs* empty of *Honey*, and within a fortnight, when the sweet *Demes* fall, filled like a *Cellar*. It is reported by some of the *Ancients*, that there is a *Tree* called *Occhus*, in the *Valleys* of *Hyrkania*, that distilleth *Honey* in the *Mornings*. It is not unlike, that the *Sap* and *Tears* of some *Trees* may be sweet. It may be also, that some sweet *Juyces*, fit for many uses, may be concocted out of *Fruits*, to the thickness of *Honey*, or perhaps of *Sugar*; the likeliest are *Rasins* of the *Sun*, *Figs* and *Corrans*: The Means may be enquired.

612.

The *Ancients* report of a *Tree*, by the *Persian Sea*, upon the *Shore-sands*, which

613.

which is nourished with the *Salt-water*; and when the *Tide* ebberth, you shall see the *Roots*, as it were, bare without *Bark* (being, as it seemeth, corroded by the *Salt*) and grasping the *Sands* like a *Crab*, which nevertheless beareth a *Fruit*. It were good to try some *hard-Trees*, as a *Service-Tree* or *Fir-tree*, by setting them within the *Sands*.

614. There be of *Plants* which they use for *Garments*; these that follow, *Hemp*, *Flax*, *Cotton*, *Nettles*, (whereof they make *Nettle Cloth*) *Sericum*, which is a *growing Silk*; they make also *Cables* of the *Bark* of *Lime-trees*. It is the *Stalk* that maketh the *Filaceous* matter commonly, and sometimes the *Down* that groweth above.

615. They have in some *Countries*, a *Plant* of a *Rosie-colour*, which shutteth in the *Night*, openeth in the *Morning*, and openeth wide at *Noon*; which the *Inhabitants* of those *Countries* say, is a *Plant* that *sleepeth*. There be *Sleepers* enough then; for almost all *Flowers* do the like.

616. Some *Plants* there are, but rare, that have a *Mossie* or *Downy Root*, and likewise that have a number of *Threds* like *Beards*, as *Mandrakes*; whereof *Witches* and *Impostors* make an ugly *Image*, giving it the form of a *face* at the *top* of the *Root*, and leave those *strings* to make a broad *beard* down to the *foot*. Also there is a kind of *Nard* in *Creet* (being a kind of *Phu*) that hath a *Root* hairy, like a *Rough-footed Doves foot*. So as you may see, there are of *Roots*, *Bulbous Roots*, *Fibrous Roots*, and *Hirsute Roots*. And I take it, in the *Bulbous*, the *Sap* hasteneth most to the *Air* and *Sun*; in the *Fibrous*, the *Sap* delighteth more in the *Earth*, and therefore putteth downward; and the *Hirsute* is a middle between both, that besides the putting forth upwards and downwards, putteth forth in round.

617. There are some *Tears* of *Trees*, which are kembered from the *Beards* of *Goats*; for when the *Goats* bite and crop them, especially in the *Mornings*, the *Dew* being on, the *Tear* cometh forth, and hangeth upon their *Beards*: Of this sort is some kind of *Ladanum*.

618. The *irrigation* of the *Plane-tree* by *Wine*, is reported by the *Ancients*, to make it fruitful. It would be tryed likewise with *Roots*; for upon *Seeds* it worketh no great effect.

619. The way to carry *Forreign Roots*, a long way, is to vessel them close in *Earthen Vessels*; but if the *Vessels* be not very great, you must make some holes in the bottom, to give some refreshments to the *Roots*; which otherwise (as it seemeth) will decay, and suffocate.

620. The ancient *Cinnamon*, was, of all other *Plants* while they grew, the *driest*, and those things which are known to comfort other *Plants*, did make that more sterile; for in *showers* it prospered worst: It grew also amongst *Bushes* of other kinds, where commonly *Plants* do not thrive, neither did it love the *Sun*. There might be one *cause* of all those effects, namely, the sparing nourishment, which that *Plant* required. *Quere*, how far *Cassia*, which is now the substitute of *Cinnamon*, doth participate of these things.

621. It is reported by one of the *Ancients*, that *Cassia*, when it is gathered, is put into the *Skins* of *Beasts* newly fleyed; and that the *Skins* corrupting, and breeding *Worms*, the *Worms* do devour the *Pith* and *Marrow* of it, and so make it hollow, but meddle not with the *Bark*, because to them it is bitter.

622. There were in ancient time, *Vines* of far greater *Bodies* than we know any; for there have been *Cups* made of them, and an *Image* of *Jupiter*. But it is like they were *wild Vines*; for the *Vines* that they use for *Wine*, are so

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often cut; and so much digged and dressed, that their *sap* spendeth into the *Grapes*, and so the *stalk* cannot increase much in *bulk*. The *Wood* of *Vines* is very durable, without *rotting*. And that which is strange, though no *Tree*, hath the *Twigs*, while they are green, so brittle, yet the *Wood* dried is extreme tough, and was used by the *Captains* of *Armies* amongst the *Romans* for their *Cudgels*.

It is reported, That in some places, *Vines* are suffered to grow like *Herbs* spreading upon the *Ground*, and that the *Grapes* of those *Vines* are very great. It were good to make tryal, whether *Plants* that use to be born up by props, will not put forth greater *Leaves*, and greater *Fruits*, if they be laid along the *Ground*; as *Hops*, *Ivy*, *Woodbine*, &c.

Quincies or *Apples*, &c. if you will keep them long, drown them in *Hony*; but because *Honey* (perhaps) will give them a taste over-lushious, it were good to make tryal in *Powder* of *Sugar*, or in *Syrup* of *Wine* onely boiled to height. Both these would likewise be tried in *Orenges*, *Lemmons*, and *Pomegranates*; for the *Powder* of *Sugar*, and *Syrup* of *Wine*, will serve for more times than once.

The *Conservation* of *Fruit* would be also tried in *Vessels*, filled with *sine Sand*, or with *Powder* of *Chalk*, or in *Meal* and *Flower*, or in *Dust* of *Oak-wood*, or in *Mill*.

Such *Fruits* as you appoint for *long keeping*, you must gather before they be full ripe, and in a *fair* and *dry day*, towards *Noon*; and when the *Wind* bloweth not *South*, and when the *Moon* is under the *Earth*, and in *decrease*.

Take *Grapes*, and hang them in an *empty Vessel*, well stopped; and set the *Vessel* not in a *Cellar*, but in some *dry place*, and it is said, they will last long. But it is reported by some, they will keep better in a *Vessel* half full of *Wines*, so that the *Grapes* touch not the *Wine*.

It is reported, that the *preserving* of the *Stalk*, helpeth to preserve the *Graps*; especially, if the *Stalk* be put into the *Pith* of *Elder*, the *Elder* not touching the *Fruit*.

It is reported by some of the *Ancients*, that *Fruit* put in *Bottles*, and the *Bottles* let down into *Wells* under *Water*, will keep long.

Of *Herbs* and *Plants*, some are good to eat *Raw*; as *Lettuce*, *Endive*, *Purslane*, *Tarragon*, *Cresses*, *Cucumbers*, *Musk-Melons*, *Raddish*, &c. Others onely after they are boiled, or have passed the *Fire*; as *Parsley*, *Clary*, *Sage*, *Parsnips*, *Turnips*, *Asparagus*, *Artichocks*, (though they also being young are eaten *raw*.) But a number of *Herbs* are not *esculent* at all; as *Worm-wood*, *Grass*, *Green-Corn*, *Centory*, *Hyssope*, *Lavender*, *Balm*, &c. The *causes* are, for that the *Herbs* that are not *Esculent*, do want the two *tastes*, in which *nourishment* resteth; which are *fat* and *sweet*, and have (contrariwise) *bitter* and *over strong tastes*, or a *Jayce* so crude, as cannot be ripened to the degree of *Nourishment*. *Herbs*, and *Plants*, that are *Esculent raw*, have *fatness*, or *sweetness* (as all *Esculent Fruits*) such are *Onions*, *Lettuce*, &c. But then it must be such a *fatness* (for as for *sweet things*, they are in effect alway *Esculent*) as is not over-gross, and loading of the *Stomack*; for *Parsnips* and *Leeks* have *fatness*; but it is too gross and heavy without *boiling*. It must be also in a substance somewhat tender; for we see *Wheat*, *Barley*, *Artichocks*, are no good *Nourishment*, till they have passed the *Fire*; but the *Fire* doth ripen, and maketh them soft and tender, and so they become *Esculent*. As for *Raddish*, and *Tarragon*, and the like, they are for *Condi-ments*, and not for *Nourishment*; and even some of those *Herbs*, which are not

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not *Esculent*, are notwithstanding *poculent*; as *Hops*, *Brooms*, &c. *Quere*, what *Herbs* are good for *Drink*, besides the two aforementioned; for that it may (perhaps) ease the charge of *Brewing*, if they make *Beer* to require less *Malt*, or make it last longer.

631. Parts fit for the *nourishment* of *Man* in *Plants*, are *Seeds*, *Roots*, and *Fruits*; but chiefly *Seeds* and *Roots*. For *Leaves*, they give no *nourishment* at all, or very little; no more do *Flowers*, or *Blossoms*, or *Stalks*. The reason is, for that *Roots*, and *Seeds*, and *Fruits*, (in as much as all *Plants* consist of an *Oily* and *Watry* substance commixed) have more of the *Oily* substance; and *Leaves*, *Flowers*, &c. of the *Watry*. And secondly, they are more *concocted*, for the *Root*, which continueth ever in the *Earth*, is still *concocted* by the *Earth*; and *Fruits*, and *Grains* (we see) are half a year, or more in *concocting*; whereas *Leaves* are out, and perfect in a Month.

632. *Plants* (for the most part) are more strong, both in *taste* and *smell*, in the *Seed*, than in the *Leaf* and *Root*. The cause is, for that in *Plants* that are not of a fierce and eager *spirit*, the vertue is increased by *Concoction* and *Maturation*, which is ever most in the *Seed*; but in *Plants* that are of a fierce and eager *spirit*, they are stronger whilest the *spirit* is inclosed in the *Root*; and the *spirits* do but weaken and dissipate, when they come to the *Air* and *Sun*; as we see it in *Onions*, *Garlick*, *Dragon*, &c. Nay, there be *Plants* that have their *Roots* very hot and *Aromatical*, and their *Seeds* rather *insipide* as *Ginger*. The cause is (as was touched before) for that the *heat* of those *Plants* is very dissipable; which under the *Earth* is contained and held in, but when it cometh to the *Air*, it exaleth.

633. The *Juyces* of *Fruits*, are either *Watry* or *Oily*. I reckon amongst the *Watry*, all the *Fruits*, out of which, *Drink* is expressed; as the *Grape*, the *Apple*, the *Pear*, the *Cherry*, the *Pomgranate*, &c. And there are some others, which though they be not in use for *Drink*, yet they appear to be of the same nature; as *Plumbs*, *Servicus*, *Mulberries*, *Rassps*, *Orenges*, *Lemmons*, &c. And for their *Juyces* that are so fleshy, as they cannot make *Drink* by expression, yet (perhaps) they may make *Drink* by mixture of *Water*.

Poculaque admittis imitantur vitea Sorbis.

And it may be *Heps* and *Brier-Berries* would do the like. Those that have *Oily* *Juyce*, are *Olives*, *Almonds*, *Nuts* of all sorts *Pine-Apples*, &c. and their *Juyces* are all *inflamable*. And you must observe also, that some of the *Watry* *Juyces*, after they have gathered *spirit*, will burn and enflame, as *Wine*. There is a third kind of *Fruit* that is sweet, without either *sharpness* or *oiliness*; such as is the *Fig* and the *Date*.

634. It hath been noted, that most *Trees*, and especially those that bear *Mast*, are fruitful but once in two years. The cause (no doubt,) is the expence of *Sap*; for many *Orchard-Trees* well cultured, will bear divers years together.

635. There is no *Tree*, which besides the *Natural Fruit*, doth bear so many *Bastard Fruits* as the *Oak* doth; for besides the *Acorn*, it beareth *Galls*, *Oak Apples*, and certain *Oak-Nuts*, which are *inflamable*, and certain *Oak-Berries* sticking close to the *Body* of the *Tree* without *Stalk*. It beareth also *Misseltö*, though rarely. The cause of all these may be, the *Closeness*, and *solidness* of the *Wood*, and *Pith* of the *Oak*; which maketh several *Juyces* find several *Eruptions*. And therefore, if you will devise to make any *Super-Plants*; you must ever give the *Sap* plentiful rising, and hard issue.

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There are two *Excrecences*, which grow upon *Trees*, both of them in the nature of *Mushromes*; the one the *Romans* called *Boletus*, which groweth upon the *Roots* of *Oaks*, and was one of the *dainties* of their *Table*: The other is *Medicinal*, that is called *Agarick* (whereof we have spoken before) which groweth upon the tops of *Oaks*; though it be affirmed by some, that it groweth also at the *Roots*. I do conceive, that many *Excrecences* of *Trees* grow chiefly, where the *Tree* is dead or faded; for that the *Natural Sap* of the *Tree*, corrupteth into some *Prenatural substance*.

The greater part of *Trees* bear *most*, and *best* on the *lower Boughs*; as *Oaks*, *Figs*, *Walnuts*, *Pears*, &c. but some bear *best* on the *top Boughs*, as *Crabs*, &c. Those that bear *best* below, are such, as *shade* do more good to than hurt: For generally all *Fruits* bear *best* lowest, because the *Sap* tireth, not having but a short way. And therefore in *Fruits* spread upon *Walls*, the lowest are the greatest, as was formerly said: So it is, the *shade*, that hindreth the *lower Boughs*, except it be in such *Trees* as delight in *shade*, or at least bear it well. And therefore there are either strong *Trees*, as the *Oak*, or else they have large *Leaves* as the *Walnut* and *Fig*, or else they grow in *Pyramis* as the *Pear*. But if they require very much *Sun*, they bear *best* on the *top*; as it is in *Crabs*, *Apples*, *Plumbs*, &c.

There be *Trees* that bear *best* when they begin to be *old*; as *Almonds*, *Pears*, *Vines*, and all *Trees* that give *Mast*. The *cause* is, for that all *Trees* that bear *Mast* have an *oily Fruit*; and young *Trees* have a more *watry Juyce*, and less concocted; and of the same kind also is the *Almond*. The *Pear* likewise though it be not *oily*, yet it requireth much *Sap*, and well concocted; for we see it is a heavy *Fruit* and solid, much more than *Apples*, *Plumbs*, &c. As for the *Vine*, it is noted that it beareth more *Grapes* when it is *Young*; but *Grapes* that make better *Wine* when it is *Old*, for that the *Juyce* is better concocted: And we see, that *Wine* is inflamable, so as it hath a kind of *oiliness*. But the most part of *Trees*, amongst which are *Apples*, *Plumbs*, &c. bear *best* when they are *Young*.

There be *Plants* that have a *Milk* in them when they are cut; as *Figs*, *Old Lettuce*, *Sow-thistles*, *Spurge*, &c. The *cause* may be an *Inception* of *Putrefaction*: For those *Milks* have all an *Acrimony*, though one would think they should be *Lenitive*. For if you write upon *Paper* with the *Milk* of the *Fig*, the *Letters* will not be seen, until you hold the *Paper* before the fire, and then they wax brown; which sheweth, that it is a sharp or fretting *Juice*. *Lettuce* is thought *poisonous*, when it is so *old* as to have *Milk*, *Spurge* a kind of *poysen* in it self; and as for *Sow-Thistles*, though *Coneys* eat them, yet *Sheep* and *Cattle* will not touch them; and besides, the *Milk* of them, rubbed upon *Warts*, in short time weareth them away: Which sheweth the *Milk* of them to be *Corrosive*. We see also, that *Wheat* and other *Corn sown*, if you take them forth of the *Ground*, before they sprout, are full of *Milk*; and the beginning of *Germination* is ever a kind of *Putrefaction* of the *Seed*. *Euphorbium* also hath a *Milk*, though not very white, which is of a great *Acrimony*. And *Saladine* hath a yellow *Milk*, which hath likewise much *Acrimony*, for it cleanseth the *Eyes*, it is good also for *Cataracts*.

Mushromes are reported to grow, as well upon the *Bodies* of *Trees*, as upon their *Roots*, or upon the *Earth*, and especially upon the *Oak*. The *cause* is, for that strong *Trees* are towards such *Excrecences* in the nature of *Earth*, and therefore put forth *Moss*, *Mushromes*, and the like.

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641. There is hardly found a Plant that yieldeth a red Juice in the Blade or Ear, except it be the Tree that beareth *Sanguis Draconis*, which groweth chiefly in the *Island Soquatra*: The Herb *Amaranthus* (indeed) is red all over; and Basil is red in the Wood; and so is Red-Sanders. The Tree of *Sanguis Draconis* groweth in the form of a Sugar-Loaf; it is like, that the Sap of that Plant, concocteth in the Body of the Tree. For we see, that Grapes and Pomegranates are red in the Juice, but are Green in the Tear. And this maketh the Tree of *Sanguis Draconis* lesser towards the top, because the Juice hasteneth not up; and besides, it is very *Astringent*, and therefore of slow motion.
642. It is reported, that sweet Moss, besides that upon the Apple-trees, groweth likewise (sometimes) upon Poplars, and yet (generally) the Poplar is a smooth Tree of Bark, and hath little Moss. The Moss of the *Larix*-tree burneth also sweet, and sparkleth in the burning. Quere, of the Mosses of *Odorate Trees*; as Cedar, Cipress, Lignum, Aloes, &c.
643. The death, that is most without pain, hath been noted to be upon the Taking of the Potion of Hemlock; which in Humanity was the form of Execution of Capital Offenders in Athens. The Poyson of the Asp, that Cleopatra used, hath some affinity with it. The cause is, for that the Torments of Death are chiefly raised by the strife of the Spirits; and these Vapours quench the Spirits by degrees; like to the Death of an extream Old Man. I conceive it is less painful than Opium, because Opium hath parts of Heat, mixed.
644. There be Fruits, that are Sweet before they be Ripe; As Mirabolanes; so Fennel Seeds are Sweet before they ripen, and after grow Spicy. And some never ripen to be sweet; as Tamarinds, Barberries, Crabs, Sloes, &c. The cause is, for that the former kind have much and subtile Heat, which causeth early sweetness; the later have a cold and accide Juice, which no Heat of the Sun can sweeten. But as for the Mirabolane, it hath parts of contrary natures for it is sweet and yet astringent.
645. There be few Herbs that have a Salt taste; and contrariwise, all Blood of Living Creatures hath a saltness; the cause may be, for that Salt, though it be the Rudiment of Life, yet in Plants the original taste remaineth not; for you shall have them bitter, sowre, sweet, biting, but seldom salt: But in Living Creatures, all those high tastes, may happen to be (sometimes) in the Humors, but are seldom in the flesh, or substance; because it is of a more oily nature, which is not very susceptible of those tastes; and the saltness it self of Blood, is but a light and secret saltness. And even among Plants, some do participate of saltness, as *Alga Marina*, Samphire, Scurvey Grass, &c. And they report there is in some of the Indian Seas, a Swimming Plant, which they call *Salgazzus*, spreading over the Sea, in such sort, as one would think it were a Meadow. It is certain, that out of the Ashes of all Plants, they extract a Salt, which they use in Medicines.
646. It is reported by one of the Ancients, that there is an Herb growing in the Water called *Lincostis*, which is full of Prickles: This Herb putteth forth another small Herb out of the Leaf, which is imputed to some moisture, that is gathered between the Prickles, which putrified by the Sun, germinateth. But I remember also, I have seen, for a great rarity, one Rose grow out of another, like Honey Suckles, that they call Top and Top-gallants.
647. Barley (as appeareth in the Malting) being steeped in Water three days, and afterwards the Water drained from it, and the Barley turned upon a dry Floor, will sprout half an Inch long, at least: And if it be let alone, and

not turned, much more, until the heart be out. *Wheat* will do the same; try it also with *Pease* and *Beans*. This *Experiment* is not like that of the *Orpin* and *Semper-vive*, for there it is of the old store, for no *Water* is added, but here it is nourished from the *Water*. The *Experiment* would be further driven; for it appeareth already, by that which hath been said, that *Earth* is not necessary to the first sprouting of *Plants*, and we see, that *Rose-Buds* set in *Water*, will blow: Therefore try whether the *Sprouts* of such *Grains* may not be raised to a further degree, as to an *Herb* or *Flower*, with *Water* only, or some small commixture of *Earth*: For if they will, it should seem by the *Experiments* before, both of the *Malt*, and of the *Roses*, that they will come far faster on in *Water* than in *Earth*; for the nourishment is easilier drawn out of *Water* than out of *Earth*. It may give some light also, that *Drink* infused with *Flesh*, as that with the *Capon*, &c. will nourish faster and easilier, than *Meat* and *Drink* together. Try the same *Experiment* with *Roots*, as well as with *Grains*. As for example, take a *Turnip* and steep it a while, and then dry it, and see whether it will sprout.

Malt in the *Drenching* will swell, and that in such a manner, as after the putting forth in *Sprouts*, and the drying upon the *Kiln*, there will be gained, at least, a *Bushel* in eight, and yet the *sprouts* are rubbed off, and there will be a *Bushel* of *Dust* besides the *Malt*: which I suppose to be, not only by the loose and open laying of the *Parts*, but by some addition of *Substance* drawn from the *Water*, in which it was steeped.

Malt gathereth a *sweetness* to the *taste*, which appeareth yet more in the *Wort*. The *Dulcoration* of *things* is worthy to be tried to the full; for that *Dulcoration* importeth a degree to *nourishment*. And the making of *things* *inalimental* to become *alimental*, may be an *Experiment* of great profit for making new *viñual*.

Most *Seeds* in the growing, leave their *Husk* or *Rind* about the *Root*; but the *Onion* will carry it up, that it will be like a cap upon the top of the *young Onion*. The cause may be, for that the *Skin* or *Husk* is not easie to break; as we see by the pilling of *Onions*, what a holding *Substance* the *Skin* is.

Plants that have *curled Leaves*, do all abound with *moisture*, which cometh so fast on, as they cannot spread themselves plain, but must needs gather together. The weakest kind of *curling* is *roughness*, as in *Clary* and *Bur*. The second is, *curling* on the sides; as in *Lettuce* and *young Cabbage*. And the third is, *folding* into an *Head*, as in *Cabbage* full grown, and *Cabbage Lettuce*.

It is reported that *Firr* and *Pine*, especially if they be old and putrefied, though they shine not as some rotten *Woods* do, yet in the sudden *breaking* they will sparkle like hard *Sugar*.

The *Roots* of *Trees* do (some of them) put downwards deep into the *Ground*; as the *Oak*, *Pine*, *Firr*, &c. Some spread more towards the *Surface* of the *Earth*; as the *Ash*, *Cypress-tree*, *Olive*, &c. The cause of this latter may be, for that such *Trees* as love the *Sun*, do not willingly descend far into the *Earth*; and therefore they are (commonly) *Trees* that shoot up much; for in their *Body* their desire of approach to the *Sun* maketh them spread the less. And the same reason, under *Ground*, to avoid recess from the *Sun*, maketh them spread the more. And we see it cometh to pass in some *Trees*, which have been planted too deep in the *Ground*, that for love of approach to the *Sun*, they forsake their first *Root*, and put out another more towards the top of the *Earth*. And we see also, that

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the *Olive* is full of *Oily Juice*, and *Ash* maketh the best *Fire*, and *Cypress* is an *hot Tree*. As for the *Oak*, which is of the former sort, it loveth the *Earth*, and therefore groweth slowly. And for the *Pine*, and *Fir* likewise, they have so much heat in themselves, as they need less the heat of the *Sun*. There be *Herbs* also, that have the same difference; as the *Herb* they call *Morsus Diaboli*, which putteth the *Root* down so low, as you cannot pull it up without *breaking*; which gave occasion to the name and fable, for that it was said it was so wholesome a *Root*, That the Devil when it was gathered, bit it for envy. And some of the *Ancients* do report, that there was a goodly *Fir* (which they desired to remove whole) that had a *Root* under ground eight cubits deep, and so the *Root* came up broken.

654. It hath been observed, that a *Branch* of a *Tree* being *unbarked* some space at the bottom, and so set into the *Ground*, hath grown even of such *Trees*, as if the *Branch* were set with the *Bark* on, they would not grow; yet contrariwise we see, that a *Tree* pared round in the *Body* above *Ground* will die. The cause may be, for that the *unbarked part* draweth the nourishment best, but the *Bark* continueth it only.

655. *Grapes* will continue fresh and moist all *Winter* long, if you hang them cluster by cluster in the *Roof* of a warm *Room*, especially, if, when you gather the cluster, you take off with the cluster some of the stock.

656. The *Reed* or *Cane* is a watry *Plant*, and groweth not but in the *Water*. It hath these properties, That it is hollow, that it is knuckled, both *stalk* and *Root*, that being dry it is more hard and fragile than other *Wood*; that it putteth forth no *Boughs*, though many *stalks* come out of one *Root*. It differeth much in greatness, the smallest being fit for thatching of *Houses*, and stopping the chinks of *Ships* better than *Glew* or *Pitch*. The second bigness is used for *Angle-rods* and *Staves*, and in *China* for beating of offenders upon the *Thighs*. The differing kinds of them are, the common *Reed*, the *Cassia Fistula*, and the *Sugar-Reed*. Of all *Plants* it boweth the easiest, and riseth again. It seemeth, that amongst *Plants* which are nourished with mixture of *Earth* and *Water*, it draweth most nourishment from *Water*; which maketh it the smoothest of all others in *Bark*, and the hollowest in *Body*.

657. The *Sap* of *Trees*, when they are let *Blood*, is of differing *Natures*. Some more watry and clear, as that of *Vines*, of *Beeches*, of *Pears*, some thick, as *Apples*; some Gummy, as *Cherries*; some frothy, as *Elms*; some milky, as *Figs*. In *Mulberries*, the *Sap* seemeth to be (almost) towards the *Bark* only; for if you cut the *Tree* a little into the *Bark* with a *Stone*, it will come forth; if you pierce it deeper with a *tool*, it will be dry. The *Trees* which have the moistest *Juices* in their *Fruit*, have commonly the moistest *Sap* in their *Body*, for the *Vines* and *Pears* are very moist, *Apples* somewhat more spongy: the *Milk* of the *Fig* hath the quality of the *Rennet*, to gather *Cheese*, and so have certain *sovere Herbs* wherewith they make *Cheese* in *Lent*.

658. The *Timber* and *Wood* are in some *Trees* more clean, in some more knotty; and it is a good tryal, to try it by speaking at one end, and laying the *Ear* at the other: For if it be knotty, the voice will not pass well. Some have the *Veins* more varied and Chamloted; as *Oak*, whereof *VVainscot* is made; *Maple*, whereof *Trenchers* are made: Some more smooth, as *Fir* and *VValnut*; some do more easily breed *VVorms* and *Spiders*; some more hardly, as it is said of *Irish Trees*. Besides, there be a number of differences

differences that concern their use : As *Oak*, *Cedar*, and *Chestnut*, are the best builders. Some are best for *Plough-timber*, as *Ash*; some for *Peers*, that are sometimes wet and sometimes dry, as *Elm*; some for *Planchers*, as *Deal*; some for *Tables*, *Cupboards* and *Desks*, as *Walnuts*; some for *Ship-timber*, as *Oaks* that grow in *moist Grounds*, for that maketh the *Timber* tough, and not apt to rift with *Ordnance*; wherein *English* and *Irish Timber* are thought to excel: some for *Masts of Ships*, as *Fir* and *Pine*, because of their length, straightness, and lightness; some for *Pale*, as *Oak*; some for *Fuel*, as *Ash*: And so of the rest.

The coming of *Trees* and *Plants* in certain *Regions*, and not in others, is sometimes *casual*; for many have been translated, and have prospered well; as *Damask Roses*, that have not been known in *England* above an hundred years, and now are so common. But the liking of *Plants* in certain *Soils* more than in others, is meerly *Natural*; as the *Fir* and *Pine* love the *Mountains*; the *Poplar*, *Willow*, *Sallow*, and *Alder*, love *Rivers* and *moist places*: the *Ash* loveth *Coppices*, but is best in *Standards* alone; *Juniper* loveth *Chalk*, and so do most *Fruit trees*; *Sampire* groweth but upon *Rocks*; *Reeds* and *Osiers* grow where they are washed with *Water*; the *Vine* loveth sides of *Hills* turning upon the *South-East Sun*, &c.

659.

The putting forth of certain *Herbs*, discovereth of what nature the *Ground* where they put forth is; as *wild Thyme* sheweth good *Feeding Ground* for *Cattel*; *Bettony* and *Strawberries* shew *Grounds* fit for *Wood*; *Camomile* sheweth mellow *Grounds* fit for *Wheat*; *Mustard-seed* growing after the *Plough*, sheweth a good *strong Ground* also for *Wheat*; *Burnet* sheweth good *Meadow*, and the like.

660.

There are found in divers *Countries*, some other *Plants* that grow out of *Trees* and *Plants*, besides *Mistletoe*: As in *Syria* there is an *Herb* called *Cassitas*, that groweth out of tall *Trees*, and windeth it self about the same *Tree* where it groweth, and sometimes about *Thorns*. There is a kind of *Polypode* that groweth out of *Trees*, though it windeth not. So likewise an *Herb* called *Fannos* upon the *Wild Olive*; and an *Herb* called *Hippocastan* upon the *Fullers Thorn*, which, they say, is good for the *Falling-sickness*.

661.

It hath been observed by some of the *Ancients*, that howsoever cold and *Easterly winds* are thought to be great enemies to *Fruit*, yet nevertheless *South-winds* are also found to do hurt, especially in the *Blossoming* time, and the more, if *showers* follow. It seemeth they call forth the *moisture* too fast. The *West winds* are the best. It hath been observed also, that *green* and *open Winters* do hurt *Trees*, insomuch, as if two or three such *Winters* come together. *Almond-Trees*, and some other *Trees* will die. The cause is the same with the former, because the *Lust* of the *Earth* overspendeth it self; howsoever some other of the *Ancients* have commended *warm Winters*.

662.

Snows lying long cause a *fruitful year*. For first, they keep in the *strength* of the *Earth*: Secondly, they *water* the *Earth* better than *Rain*; for in *snow* the *Earth* doth (as it were) suck the *Water* as out of the *Teat*: Thirdly, the *moisture* of *snow* is the finest *moisture*, for it is the *Froth* of the *Cloudy Waters*.

663.

Showers, if they come a little before the *ripening* of *Fruits*, do good to all *succulent* and *moist Fruits*, as *Vines*, *Olives*, *Pomegranates*; yet it is rather for plenty than for goodness, for the best *Wines* are in the *driest Vintages*.

664.

Small showers are likewise good for *Corn*, so as *parching heats* come not upon them. Generally, *Night-showers* are better than *Day showers*; for that the *Sun* followeth not so fast upon them: And we see, even in *watering* by the *Hand*, it is best in *Summer-time* to water in the *Evening*.

665. The *differences* of *Earths*, and the *tryal* of them, are worthy to be diligently enquired. The *Earth* that with *showers* doth easily *soften*, is commended; and yet some *Earth* of that kind will be very dry and hard before the *showers*. The *Earth* that casteth up from the *Plough* a great *clod*, is not so good as that which casteth up a smaller *clod*. The *Earth* that putteth forth *Moss* easily, and may be called *Mouldy*, is not good. The *Earth* that smelleth well upon the *Digging*, or *Ploughing*, is commended; as containing the *Juyce* of *Vegetables* almost already prepared. It is thought by some, that the *ends* of low *Rain-bows* fall more upon one kind of *Earth* than upon another: As it may well be, for that that *Earth* is most *rosy*; and therefore it is commended for a sign of a good *Earth*. The *poorness* of the *Herbs* (it is plain) shew the *poorness* of the *Earth*, and especially, if they be in *colour* more dark: But if the *Herbs* shew *withered* or *blasted* at the top, it sheweth the *Earth* to be very *cold*; and so doth the *Mossiness* of *Trees*. The *Earth* whereof the *Grass* is soon *parched* with the *Sun* and *tosted*, is commonly *forced Earth*, and barren in his own nature. The *tender*, *chessom*, and *mellow Earth* is the best; being meer *Mould*, between the two extreames of *Clay* and *Sand*, especially, if it be not *Loamy* and *Binding*. The *Earth* that after *Rain* will scarce be *Ploughed*, is commonly *fruitful*; for it is *cleaving*, and full of *Juyce*.

666. It is strange, which is observed by some of the *Ancients*, that *Dust* helpeth the *fruitfulness* of *Trees*, and of *Vines* by name; inso much, as they cast *Dust* upon them of purpose. It should seem that that *powdring*, when a *shower* cometh, maketh a kind of *soyling* to the *Tree*, being *Earth* and *Water* finely laid on. And they note, that *Countreys* where the *Fields* and *Ways* are *dusty*, bear the best *Vines*.

667. It is commended by the *Ancients* for an excellent *help* to *Trees*, to lay the *Stalks* and *Leaves* of *Lupines* about the *Roots*, or to *Plough* them into the *Ground*, where you will sow *Corn*. The *burning* also of the *cuttings* of *Vines*, and *casting* them upon *Land*, doth much good. And it was generally received of old, that the *dunging* of *Grounds* when the *West-wind* bloweth, and in the *decrease* of the *Moon*, doth greatly help the *Earth* (as it seemeth) being then more *thirsty*, and open to receive the *Dung*.

668. The *Grafting* of *Vines* upon *Vines* (as I take it) is not now in use. The *Ancients* had it, and that three ways; the first was *Insition*, which is the ordinary manner of *Grafting*: The second was *Terebration*, through the *middle* of the *Stock*, and putting in the *Gions* there: And the third was *Paring* of two *Vines* that grow together to the *Marrow*, and binding them close.

669. The *Diseases* and ill *Accidents* of *Corn*, are worthy to be enquired, and would be more worthy to be enquired, if it were in *Mens* power to help them; whereas many of them are not to be remedied. The *Mildew* is one of the greatest, which (out of question) cometh by *closefness* of *Air*; and therefore in *Hills*, or large *Champaign-Grounds*, it seldom cometh, such as is with us *York's Wold*. This cannot be remedied, otherwise than that in *Countreys* of small enclosure the *Grounds* be turned into larger *Fields*: Which I have known to do good in some *Farms*.

Another

Another Disease is the putting forth of *Wild Oats*, whereinto *Corn* oftentimes (especially *Barley*) doth degenerate. It hapneth chiefly from the weakness of the *Grain* that is sown; for if it be either too old or mouldy, it will bring forth *wild Oats*. Another disease is the satiety of the *Ground*; for if you sow one *Ground* still with the same *Corn* (I mean not the same *Corn* that grew upon the same *Ground*, but the same kind of *Grain*, as *Wheat*, *Barley*, &c.) it will prosper but poorly; therefore besides the resting of the *Ground*, you must vary the *Seed*. Another ill Accident is from the *Winds*, which hurt at two times; at the *flowring* by shaking off the *Flowers*, and at the full ripening by shaking out the *Corn*. Another ill Accident is *Drought* at the spindling of the *Corn*, which with us is rare, but in hotter *Countreys* common, insomuch as the word *Calamitas* was first derived from *Calamus*, when the *Corn* could not get out of the stalk. Another ill Accident is *Over-wet* at sowing time, which with us breedeth much *Dearth*, insomuch as the *Corn* never cometh up; and (many times) they are forced to re-sow *Summer-Corn*, where they sowed *Winter-Corn*. Another ill Accident is *bitter Frosts*, continued without *Snow*, especially in the beginning of the *Winter*, after the *Seed* is new sown. Another Disease is *Worms*, which sometimes breed in the *Root*, and happen upon hot *Suns* and *showers* immediately after the sowing; and another *Worm* breedeth in the *Ear* it self, especially when hot *Suns* break often out of *Clouds*. Another Disease is *Weeds*; and they are such, as either choak and over-shadow the *Corn*, and bear it down, or starve the *Corn*, and deceive it of nourishment. Another Disease is, *over-rankness* of the *Corn*, which they use to remedy by *Mowing* it after it is come up, or putting *Sheep* into it. Another ill Accident is, laying of *Corn* with great *Rains* near or in *Harvest*. Another ill Accident is, if the *Seed* happen to have touched *Oyl*, or any thing that is fat; for those *Substances* have an antipathy with nourishment of *Water*.

The remedies of the Diseases of *Corn* have been observed as followeth. The Steeping of the *Grain* before sowing, a little time in *Wine*, is thought a preservative; the Mingling of *Seed-Corn* with *Ashes*, is thought to be good; the sowing at the wane of the *Moon*, is thought to make the *Corn* sound. It hath not been practised, but it is thought to be of use to make some *Missellane* in *Corn*; as if you sow a few *Beans* with *Wheat*, your *Wheat* will be the better. It hath been observed, that the sowing of *Corn* with *Housleek* doth good. Though *Grain* that toucheth *Oyl* or *Fat* receiveth hurt, yet the steeping of it in the *Dregs* of *Oyl*, when it beginneth to putrifie, (which they call *Amurca*) is thought to assure it against *Worms*. Is is reported also, that if *Corn* be mowed, it will make the *Grain* longer, but emptier, and having more of the *Husk*.

It hath been noted, that *Seed* of a year old is the best, and of two or three years is worse; and that which is more old is quite barren, though (no doubt) some *Seeds* and *Grains* last better than others. The *Corn* which in the *Vanning* lieth lowest is the best; and the *Corn* which broken or bitten, retaineth a little *yellowness*, is better than that which is very white.

It hath been observed, that of all *Roots* of *Herbs*, the *Root* of *Sorrel* goeth the furthest into the *Earth*, insomuch as it hath been known to go three cubits deep; and that it is the *Root* that continueth fit (longest) to be set again, of any *Root* that groweth. It is a cold and acide *Herb*, that (as it seemeth) loveth the *Earth*, and is not much drawn by the *sun*.

670.

671.

672.

673.

It hath been observed, that some *Herbs* like best, being watered with *Salt-water*; as *Radish*, *Beet*, *Rue*, *Penny-royal*. This tryal would be extended to some other *Herbs*; especially such as are strong; as *Tarragon*, *Mustard-seed*, *Rocket*, and the like.

674.

It is strange, that is generally received, how some *poysinous Beasts* affect *odorate* and *wholsome Herbs*; as, that the *Snake* loveth *Fennel*, that the *Toad* will be much under *Sage*, that *Frogs* will be in *Cinquefoil*. It may be it is rather the *Shade*, or other *Coverture*, that they take liking in; than the virtue of the *Herb*.

675.

It were a matter of great profit, (save that I doubt it is too conjectural to venture upon) if one could discern what *Corn*, *Herbs*, or *Fruits*, are like to be in *Plenty* or *Scarcity*, by some *Signs* and *Prognosticks* in the beginning of the year: For as for those that are like to be in *Plenty*, they may be bargained for upon the *Ground*; as the old relation was of *Thales*, who to shew how easie it was for a *Philosopher* to be rich, when he foresaw a great plenty of *Olives*, made a *Monopoly* of them. And for *Scarcity*, Men may make profit in keeping better the old store. Long continuance of *Snow* is believed to make a *fruitful year* of *Corn*; an *early Winter*, or a very late *Winter*, a *barren year* of *Corn*; an open and *serene Winter*, an ill year of *Fruit*. These we have partly touched before, but other *Prognosticks* of like nature are diligently to be enquired.

676.

There seem to be in some *Plants singularities*, wherein they differ from all other. The *Olive* hath the *oily part* only on the *outside*, whereas all other *Fruits* have it in the *Nut* or *Kernel*. The *Fir* hath (in effect) no *Stone*, *Nut*, nor *Kernel*; except you will count the little *Grains*, *Kernels*. The *Pomegranate* and *Pine-Apple* have only, amongst *Fruits*, *Grains*, distinct in several *Cells*. No *Herbs* have *curled Leaves*, but *Cabbage* and *Cabbage-Lettuce*. None have double *Leaves*, one belonging to the *Stalk*, another to the *Fruit* or *Seed*, but the *Artichoke*. No *Flower* hath that kind of spread that the *Woodbine* hath. This may be a large *Field of Contemplation*, for it sheweth that in the *Frame of Nature* there is, in the producing of some *species*, a composition of *Matter*, which hapneth oft, and may be much diversified; in others, such as hapneth rarely, and admitteth little variety. For so it is likewise in *Beasts*; *Dogs* have a resemblance with *Wolves*, and *Foxes*, *Horses* with *Asses*, *Kine* with *Bustes*, *Hares* with *Coneys*, &c. And so in *Birds*, *Kites* and *Kestrels* have a resemblance with *Hawks*; *Common Doves* with *Ring Doves* and *Turtles*; *Black-Birds* with *Thrushes* and *Mavis*; *Crows* with *Ravens*, *Daws*, and *Choughs*, &c. But *Elephants* and *Swine* amongst *Beasts*, and the *Bird of Paradise*, and the *Peacock* amongst *Birds*, and some few others, have scarce any other *species* that have affinity with them.

We leave the *Description of Plants* and their *Virtues* to *Herbals*, and other like *Books of Natural History*, wherein *Mens diligence* hath been great, even to *Curiosity*. For our *Experiments* are only such, as do ever ascend a degree to the *deriving of Causes*, and *extracting of Axioms*, which we are not ignorant, but that some, both of the *Ancient* and *Modern Writers* have also laboured; but their *Causes* and *Axioms* are so full of *Imagination*, and so infected with the old received *Theories*, as they are meer *Inquinations of Experience*, and concoct it not.

It

IT hath been observed by some of the *Ancients*, that *Skins*, (especially of *Rams*) newly pulled off, and applied to the *Wounds* of *Stripes*, do keep them from swelling and exulcerating, and likewise heal them, and close them up: and that the *Whites* of *Eggs* do the same. The cause is, a temperate *Conglutination*, for both *Bodies* are clammy and viscous, and do bridle the *Deflux* of *Humors* to the hurts, without penning them in too much.

You may turn (almost) all *Flesh* into a fatty substance, if you take *Flesh* and cut it into pieces, and put the pieces into a *Glass* covered with *Parchment*, and so let the *Glass* stand six or seven hours in *boyling VVa-ter*. It may be an experiment of profit, for making of *Fat* or *Grease* for many uses: But then it must be of such *Flesh* as is not edible; as *Horses*, *Dogs*, *Bears*, *Foxes*, *Badgers*, &c.

IT is reported by one of the *Ancients*, that *new VVine* put into *Vessels*, well stopped, and the *Vessels* let down into the *Sea*, will accelerate very much the making of them ripe and potable: the same would be tryed in *Wort*.

Beasts are more *Hairy* than *Men*; and *Savage Men* more than *Civil*; and the *Plumage* of *Birds* exceedeth the *Pilosity* of *Beasts*. The cause of the smoothness in *Men*, is not any abundance of *Heat* and *Moisture*, though that indeed causeth *Pilosity*; but there is requisite to *Pilosity*, not so much *Heat* and *Moisture*, as *Excrementitious Heat* and *Moisture*; (for whatsoever assimilath goeth not into the *Hair*) and *Excrementitious Moisture* aboundeth most in *Beasts*, and *Men* that are more *savage*. Much the same reason is there of the *Plumage* of *Birds*; for *Birds* assimilate less, and excern more than *Beasts*, for their *Excrements* are ever liquid, and their *Flesh* (generally) more dry; beside, they have not *Instruments* for *Urine*, and so all the *Excrementitious Moisture* goeth into the *Feathers*: And therefore it is no marvel though *Birds* be commonly better Meat than *Beasts*, because their *flesh* doth assimilate more finely, and se-cerneth more subtilly. Again, the *Head* of *Man* hath *Hair* upon the *first Birth*, which no other part of the *Body* hath. The cause may be want of *Perspiration*; for much of the matter of *Hair* in the other parts of the *Body* goeth forth by insensible *Perspiration*. And besides, the *Skull*, being of a more solid substance, nourisheth and assimilath less, and excerneth more; and so likewise doth the *Chin*. We see also that *Hair* cometh not upon the *Palms* of the *Hands*, nor *Soals* of the *Feet*, which are parts more perspirable. And *Children* likewise are not *Hairy*, for that their *Skins* are more perspirable.

Birds are of swifter motion than *Beasts*; for the *flight* of many *Birds* is swifter than the race of any *Beasts*. The cause is, for that the *Spirits* in *Birds* are in greater proportion, in comparison of the bulk of their *Body*, than in *Beasts*. For as for the reason that some give, that they are partly carried, whereas *Beasts* go, that is nothing; for by that reason, swimming should be swifter than running: And that kind of carriage also, is not without labour of the *VVing*.

677.

Experiment
Solitary,
touching
Healing of
Wounds.

678.

Experiment
Solitary,
touching
Fat diffused in
Flesh.

679.

Experiment
Solitary,
touching
Ripening of
Drink before
the time.

680.

Experiment
Solitary,
touching
Pilosity and
Plumage.

681.

Experiment
Solitary,
touching the
Quickness of
Motion in
Birds.

The

682.
Experiment
Solitary,
touching the
Different clear-
ness of the Sea

The Sea is clearer when the North-wind bloweth, than when the South-wind. The cause is, for that Salt-water hath a little Oyliness in the Surface thereof, as appeareth in very hot days: And again, for that the Southern-wind relaxeth the Water somewhat; as no Water boyling, is so clear as cold Water.

683.
Experiment
Solitary,
touching the
Different Heats
of Fire and
Boiling Water.

Fire burneth Wood, making it first Luminous, then black and brittle, and lastly, broken and incinerate; scalding Water doth none of these. The cause is, for that by Fire the Spirit of the Body is first refined, and then emitted; whereof the refining or attenuation causeth the light, and the emission; first the fragility, and after the dissolution into Ashes, neither doth any other Body enter. But in Water, the Spirit of the Body is not refined so much; and besides, part of the Water entreth, which doth increase the Spirit, and in a degree extinguish it; therefore we see that hot Water will quench Fire. And again, we see that in Bodies wherein the Water doth not much enter, but only the heat passeth, hot Water worketh the effects of Fire: As in Eggs boiled and roasted, (into which the Water entreth not at all) there is scarce difference to be discerned; but in Fruit and Flesh, whereinto the Water entreth in some part, there is much more difference.

684.
Experiment
Solitary,
touching the
Qualification
of Heat by Moi-
sture.

The bottom of a Vessel of boyling Water (as hath been observed) is not very much heated, so as men may put their hand under the Vessel, and remove it. The cause is, for that the moisture of Water, as it quengeth Coals where it entreth, so it doth allay heat where it toucheth. And therefore note well, that moisture, although it doth not pass through Bodies without Communication of some substance (as heat and cold do) yet it worketh manifest effects; not by entrance of the Body, but by qualifying of the heat and cold, as we see in this instance. And we see likewise, that the water of things distilled in water, (which they call the Bath) differeth not much from the water of things distilled by Fire. We see also, that Pewter-dishes with Water in them will not melt easily, but without it they will. Nay, we see more, that Butter or Oyl, which in themselves are inflamable, yet by virtue of their moisture, will do the like.

685
Experiment
Solitary,
touching
Yawning.

It hath been noted by the Ancients, that it is dangerous to pick ones Ear whilst he Yawneth. The cause is, for that in Yawning, the inner Parchment of the Ear is extended by the drawing in of the Spirit and Breath; for in Yawning and Sighing both, the Spirit is first strongly drawn in, and then strongly expelled.

686.
Experiment
Solitary,
touching the
Hiccough.

It hath been observed by the Ancients, that Sneezing doth cease the Hiccough. The cause is, for that the Motion of the Hiccough is, a lifting up of the Stomach; which Sneezing doth somewhat depress, and divert the motion another way. For first, we see that the Hiccough cometh of fulness of Meat, (especially in Children) which causeth an extension of the Stomach: We see also, it is caused by acide Meats or Drinks, which is by the pricking of the Stomach. And this motion is ceased, either by Diversion, or by Detention of the Spirits: Diversion, as in Sneezing; Detention, as we see holding of the Breath doth help somewhat to cease the Hiccough, and putting a Man into an earnest study doth the like, as is commonly used: And Vinegar put to the Nostrils or Gargarized doth it also; for that it is Astringent, and inhibiteth the motion of the Spirit.

Looking

Looking against the *Sun* doth induce *Sneezing*. The *cause* is, not the *beating* of the *Nostrils*; for then the *holding* up of the *Nostrils* against the *Sun*, though one wink, would do it, but the *drawing* down of the *moisture* of the *Brain*: For it will make the *Eyes* run with *water*, and the *drawing* of *moisture* to the *Eyes*, doth draw it to the *Nostrils* by *Motion* of *Consent*, and so followeth *Sneezing*. As contrarywise, the *Tickling* of the *Nostrils* within doth draw the *moisture* to the *Nostrils*, and to the *Eyes* by *consent*, for they also will *water*. But yet it hath been observed, that if one be about to *sneeze*, the rubbing of the *Eyes* till they run with *water*, will prevent it. Whereof the *cause* is, for that the *humor*, which was descending to the *Nostrils*, is diverted to the *Eyes*.

687.
Experiment
Solitary,
touching
Sneezing.

The *Teeth* are more by *cold drink*, or the like, affected, than the other *parts*. The *cause* is double; the one, for that the *resistance* of *Bone* to *cold*, is greater than of *Flesh*; for that the *Flesh* shrinketh, but the *Bone* resisteth, whereby the *Cold* becometh more eager. The other is, for that the *Teeth* are *parts* without *Blood*, whereas *Blood* helpeth to qualifie the *cold*. And therefore we see, that the *Sinews* are much affected with *Cold*, for that they are *parts* without *Blood*. So the *Bones* in sharp *Colds* wax *brittle*; and therefore it hath been seen, that all *contusions* of *Bones* in *hard weather*, are more difficult to cure.

688.
Experiment
Solitary,
touching the
Tenderness of
the *Teeth*.

It hath been noted, that the *Tongue* receiveth more easily *tokens* of *Diseases* than the other *parts*; as of *heats* within, which appear most in the *blackness* of the *Tongue*. Again, *Pied Cattel* are spotted in their *Tongues*, &c. The *cause* is (no doubt) the *tenderness* of the *part*, which thereby receiveth more easily all *alterations* than any other *parts* of the *Body*.

689.
Experiment
Solitary,
touching the
Tongue.

When the *Mouth* is out of *taste*, it maketh things taste sometimes *salt*, chiefly *bitter*, and sometimes *loathsome*, but never *sweet*. The *cause* is, the *corrupting* of the *moisture* about the *Tongue*, which many times turneth *bitter*, and *salt*, and *loathsome*, but *sweet* never; for the rest are *degrees* of *corruption*.

690.
Experiment
Solitary,
touching the
Taste.

It was observed in the *Great Plague* of the last year, that there were seen in divers *Ditches*, and low *Grounds* about *London*, many *Toads* that had *Tails* two or three inches long at the least, whereas *Toads* (usually) have no *Tails* at all; which argueth a great disposition to *putrefaction* in the *Soil* and *Air*. It is reported likewise, that *Roots* (such as *Carrots* and *Parsnips*) are more *sweet* and *luscious* in infectious years than in other years.

691.
Experiment
Solitary,
touching
Some *Prognostical*
Signs of *Pestilential*
Seasons.

Wise *Physicians* should with all diligence inquire what *simples* Nature yieldeth, that have extream *subtile parts* without any *Mordication* or *Acrimony*; for they undermine that which is *hard*, they open that which is *stopped* and *shut* and they expel that which is *offensive* gently, without too much *perturbation*. Of this kind are *Elder-flowers*, which therefore are proper for the *Stone*; of this kind is the *Dwarf-pine*, which is proper for the *Jaundies*; of this kind is *Harts-horn*, which is proper for *Agues* and *Infections*; of this kind is *Piony*, which is proper for *Stoppings* in the *Head*; of this kind is *Fumitory*, which is proper for the *Spleen*; and

692.
Experiment
Solitary,
touching
Special Simples
for *Medicines*.

and a number of others. Generally, divers *Creatures* bred of *Putrefaction*, though they be somewhat loathsome to take, are of this kind; as *Earth-worms*, *Timber-fowls*, *Snails*, &c. And I conceive, that the *Trochises* of *Vipers*, (which are so much magnified) and the *flesh* of *Snakes* some ways condited and corrected (which of late are grown into some credit) are of the same nature. So the *parts* of *Beasts* putrefied (as *Castoreum* and *Musk*, which have extream subtil parts) are to be placed amongst them. We see also, that *putrefactions* of *Plants* (as *Agarick* and *Jews-Ear*) are of greatest vertue. The cause is, for that *putrefaction* is the subtillest of all motions in the parts of *Bodies*. And since we cannot take down the *lives* of *Living Creatures* (which some of the *Paracelsians* say, (if they could be taken down) would make us *Immortal*,) the next is, for subtilty of operation to take *Bodies* putrefied, such as may be safely taken.

693.
Experiments
in Consort,
touching
Venus.

It hath been observed by the *Ancients*, that much use of *Venus* doth dim the sight, and yet *Eunuchs*, which are unable to generate, are (nevertheless) also dim-sighted. The cause of dimness of sight in the former, is the expence of *Spirits*; in the latter, the over-moisture of the *Brain*; for the over-moisture of the *Brain* doth thicken the *Spirits* visual, and obstructeth their passages, as we see by the decay in the sight in *Age*, where also the diminution of the *Spirits* concurrereth as another cause. We see also, that *blindness* cometh by *Rheums* and *Cataracts*. Now in *Eunuchs* there are all the notes of moisture; as the swelling of their *Thighs*, the looseness of their *Belly*, the smoothness of their skin, &c.

694.

The pleasure in the Act of *Venus*, is the greatest of the pleasures of the senses; the matching of it with *Itch* is improper, though that also be pleasing to the touch, but the causes are profound. First, all the *Organs* of the senses qualifie the motions of the *Spirits*, and make so many several species of motions, and pleasures or displeasures thereupon, as there be diversities of *Organs*. The Instruments of *Sight*, *Hearing*, *Taste*, and *Smell*, are of several frame, and so are the parts for Generation; therefore *Scaliger* doth well to make the pleasure of Generation a sixth Sense. And if there were any other differing *Organs*, and qualified Perforations for the *Spirits* to pass, there would be more than the Five Senses: Neither do we well know, whether some *Beasts* and *Birds* have not Senses, that we know not, and the very *Sent* of *Dogs* is almost a sense by it self. Secondly, the Pleasures of the Touch are greater and deeper than those of the other Senses, as we see in Warming upon Cold, or Refrigeration upon Heat: For as the Pains of the Touch are greater than the offences of other Senses, so likewise are the Pleasures. It is true, that the affecting of the *Spirits* immediately, and (as it were) without an *Organ*, is of the greatest pleasure, which is but in two things, sweet smells and Wine, and the like sweet vapors. For smells, we see their great and sudden effect in fetching Men again when they swoon for Drink, it is certain, that the pleasure of Drunkenness is next the pleasure of *Venus*; and great Joies (likewise) make the *Spirits* move and touch themselves; and the pleasure of *Venus* is somewhat of the same kind.

695.

It hath been always observed, that Men are more inclined to *Venus* in the Winter, and Women in the Summer. The cause is, for that the *Spirits* in a Body more hot and dry, (as the *Spirits* of Men are) by the Summer are more exhaled and dissipated, and in the Winter more condensed and kept entire; but in Bodies that are cold and moist, (as Womens are) the Summer doth

doth cherish the *Spirits*, and calleth them forth, the *Winter* doth dull them. Furthermore, the *Abstinence* or *Intermission* of the use of *Venus*, in moist and well habituate Bodies, breedeth a number of *Diseases*; and especially dangerous *imposithumations*. The reason is evident, for that it is a principal *evacuation*, especially of the *Spirits*; for of the *Spirits*, there is scarce any *evacuation*, but in *Venus* and *exercise*. And therefore the *emission* of either of them breedeth all *diseases* of *Repletion*.

The nature of *Vivification* is very worthy the enquiry; and as the Nature of things is commonly better perceived in small than in great, and in unperfect than in perfect, and in parts than in whole; so the Nature of *Vivification* is best enquired in *Creatures* bred of *Putrefaction*. The contemplation whereof hath many excellent Fruits. First, in disclosing the original of *Vivification*. Secondly, in disclosing the original of *Figuration*. Thirdly, in disclosing many things in the nature of perfect *Creatures*, which in them lie more hidden. And fourthly, in *traducing*, by way of operation, some observations in the *Insecta*, to work effects upon perfect *Creatures*. Note, that the word *Insecta* agreeth not with the matter, but we ever use it for brevities sake, intending by it *Creatures* bred of *Putrefaction*.

Experiments
in Consort,
touching the
Insecta.

The *Insecta* are found to breed out of several matters: Some breed of *Mud* or *Dung*; as the *Earth-worms*, *Eels*, *Snakes*, &c. For they are both *Putrefactions*: For *Water* in *Mud* do putrefie, as not able to preserve it self; and for *Dung*, all *Excrements* are the refuse and *putrefactions* of nourishment. Some breed in *Wood*, both growing, and cut down. *Quere*, in what *Woods* most, and at what seasons? We see that the *Worms* with many feet, which round themselves into *Balls*, are bred chiefly under *Logs* of *Timber*, but not in the *Timber*, and they are said to be found also (many times) in *Gardens* where no *Logs* are. But it seemeth their *Generation* requireth a coverture both from *Sun*, and *Rain* or *Dew*, as the *Timber* is; and therefore they are not *venemous*, but (contrariwise) are held by the *Physitians* to clarify the *Blood*. It is observed also, that *Cimices* are found in the holes of *Bedsides*. Some breed in the *Hair* of *Living Creatures*; as *Lice* and *Ticks*, which are bred by the *sweat* close kept, and somewhat airified by the *Hair*. The *Excrements* of *Living Creatures* do not only breed *Insecta* when they are excerned, but also while they are in the *Body*; as in *Worms*, whereto Children are most subject, and are chiefly in the *Guts*. And it hath been lately observed by *Physitians*, that in many *Pestilent Diseases* there are *Worms* found in the upper parts of the *Body*, where *Excrements* are not, but only *humors* putrefied, *Fleas* breed principally of *straw* or *Mats*, where there hath been a little *moisture*, or the *Chamber* and *Bed straw* kept close, and not aired. It is received, that they are killed by strewing *Wormwood* in the *Rooms*. And it is truly observed, that *bitter things* are apt rather to kill than engender *Putrefaction*, and they be things that are fat or sweet that are aptest to putrefie. There is a *Worm* that breedeth in *Meal* of the shape of a large white *Maggot*, which is given as a great dainty to *Nightingales*. The *Moth* breedeth upon *Cloth*, and other *Lanifices*, especially if they be laid up dankish and wet. It delighteth to be about the flame of a *Candle*. There is a *Worm* called *Weevil*, bread under *Ground*, and that feedeth upon *Roots*, as *Parsnips*, *Carrots*, &c. Some breed in *Waters*; especially shaded, but they must be standing *Waters*; as the *Water-Spider* that hath six *Legs*. The *Fly* called the *Gad-fly* breedeth of somewhat that swimeth upon the top of the *Water*, and

696.

is

is most about *Ponds*. There is a *Worm* that breedeth of the *Dregs* of *Wine* decayed, which afterwards (as is observed by some of the *Ancients*) turneth into a *Gnat*. It hath been observed by the *Ancients*, that there is a *Worm* that breedeth in old *Snow*, and is of colour reddish, and dull of motion, and dieth soon after it cometh out of *Snow*; which should shew that *Snow* hath in it a secret *warmth*, for else it could hardly vivifie. And the reason of the dying of the *Worm* may be the sudden exhaling of that little *Spirit*, as soon as it cometh out of the *cold*, which had shut it in. For as *Putterflies* quicken with *heat*, which were benumbed with *cold*; so *Spirits* may exhale with *heat*, which were preserved in *cold*. It is affirmed, both by *Ancient* and *Modern* observation, that in *Furnaces* of *Copper* and *Brass*, where *Chalcites* (which is *Vitriol*) is often cast in to mend the working, there riseth suddenly a *Fly* which sometimes moveth, as if it took hold on the *Walls* of the *Furnace*; sometimes is seen moving in the *fire* below, and dieth presently as soon as it is out of the *Furnace*. Which is a noble *instance*, and worthy to be weighed, for it sheweth that as well *violent heat* of *fire*, as the *gentle heat* of *Living Creatures* will vivifie, if it have matter proportionable. Now the great *axiom* of *Vivification* is, that there must be *heat* to dilate the *Spirit* of the *Body*, an *Active Spirit* to be dilated, matter *viscous* or *tenacious* to hold in the *Spirit*, and that matter to be put forth and *figured*. Now a *Spirit* dilated by so ardent a *fire* as that of the *Furnace*, as soon as ever it cooleth never so little, congealeth presently. And (no doubt) this *action* is furthered by the *Chalcites*, which hath a *Spirit* that will put forth and germinate, as we see in *Chimical Tryals*. Briefly, most *things* putrefied bring forth *Insecta* of several names, but we will not take upon us now to enumerate them all.

697.

The *Insecta* have been noted by the *Ancients* to feed little: But this hath not been diligently observed; for *Grashoppers* eat up the *Green* of whole *Countreys*, and *Silk-worms* devour *Leaves* swiftly, and *Ants* make great provision. It is true, that *Creatures* that sleep and rest much, eat little, as *Dormice* and *Bats*, &c. they are all without *Blood*; which may be, for that the *Juyce* of their *Bodies* is almost all one; not *Blood*, and *Flesh*, and *Skin*, and *Bone*, as in perfect *Creatures*: The *integral parts* have extream variety, but the *similar parts* little. It is true, that they have (some of them) *Diaphragms*; and an *Intestine*; and they have all *Skins*, which in most of the *Insecta*, are cast often. They are not (generally) of *long life*; yet *Bees* have been known to live seven years; and *Snakes* are thought, the rather for the *casting* of their *spoils*, to live till they be old; and *Eels*, which many times breed of *putrefaction*, will live and grow very long; and those that interchange from *Worms* to *Flies* in the *Summer*, and from *Flies* to *Worms* in the *Winter*, have been kept in *Boxes* four years at the least; yet there are certain *Flies* that are called *Ephemera* that live but a day. The *cause* is, the exility of the *Spirit*, or perhaps the absence of the *Sun*; for that if they were brought in, or kept close, they might live longer. Many of the *Insecta* (as *Butter-flies* and other *Flies*) revive easily, when they seem dead, being brought to the *Sun* or *Fire*. The *cause* whereof is, the *diffusion* of the *Vital Spirit*, and the *easie dilating* of it by a little *heat*. They live a good while after their *heads* are off, or that they be cut in pieces; which is caused also, for that their *Vital Spirits* are more diffused throughout all their *parts*, and less confined to *Organs* than in perfect *Creatures*.

698.

The *Insecta* have *voluntary Motion*, and therefore *imagination*. And whereas some of the *Ancients* have said, that their *Motion* is indeterminate, and their *imagination* indefinite, it is negligently observed; for *Ants* go right forwards

forwards to their Hills : and *Bees* do (admirably) know the way from a Flowry Heath, two or three miles off to their Hives. It may be *Gnats* and *Flies* have their *Imagination* more mutable and giddy, as *small Birds* likewise have. It is said by some of the *Ancients*, that they have only the *Sense* of *Feeling*, which is manifestly untrue; for if they go forth right to a place, they must needs have *Sight*: Besides, they delight more in one *Flower* or *Herb*, than in another, and therefore have *taste*. And *Bees* are called with *sound* upon *Brass*, and therefore they have *hearing*. Which sheweth likewise, that though their *Spirits* be diffused, yet there is a *Seat* of their *Senses* in their Head.

Other Observations concerning the Insecta, together with the Enumeration of them, we refer to that place where we mean to handle the Title of Animals in general.

A Man leapeth better with *weights* in his *hands*, than without. The cause is, for that the *weight* (if it be proportionable) strengthneth the *Sinews*, by contracting them; for otherwise, where no *contraction* is needful, *weight* hindreth. As we see in *Horse Races*. Men are curious to foresee that there be not the least *weight* upon the one *Horse* more than upon the other. In *Leaping* with *Weights*, the *Arms* are first cast backwards, and then forwards, with so much the greater force; for the *hands* go backward before they take their raise. *Quare*, if the contrary *motion* of the *Spirits*, immediately before the *Motion* we intend, doth not cause the *Spirits* as it were to break forth with more force; as *Breath* also drawn, and kept in, cometh forth more forcibly: And in *casting* of any *thing*, the *Arms*, to make a greater swing, are first cast backward.

699.

Experiment
Solitary,
touching
Leaping.

700.

Experiment
Solitary,
touching the
Pleasures and
Displeasures of
the Senses,
especially of
Hearing.

OF *Musical Tones* and *unequal Sounds*, we have spoken before, but touching the *pleasure* and *displeasure* of the *Senses* not so fully. *Harsh Sounds*, as of a *Saw* when it is sharpened, *Grinding* of one *Stone* against another, *squeaking* or *scritchings* noises, make a *shivering* or *horror* in the *Body*, and set the *Teeth* on edge. The cause is, for that the *objects* of the *Ear* do affect the *Spirits* (immediately) most with *pleasure* and offence. We see there is no *colour* that affecteth the *Eye* much with *displeasure*. There be *sights* that are *horrible*, because they excite the *memory* of *things* that are *odious* or *fearful*; but the same *things* painted, do little affect. As for *Smells*, *Tastes*, and *Touches*, they be *things* that do affect by a *Participation* or *Impulsion* of the *body* of the *Object*. So it is *Sound* alone that doth immediately and incorporeally affect most. This is most manifest in *Musick*, and *Concords*, and *Discords* in *Musick*: For all *Sounds*, whether they be sharp or flat, if they be sweet, have a roundness and *equality*; and if they be harsh, are *unequal*: For a *Discord* it self, is but a *harshness* of *divers sounds* meeting. It is true, that *inequality*, not staid upon, but passing, is rather an increase of *sweetness*; as in the *Purling* of a *Wreathed String*, and in the *raucity* of a *Trumpet*, and in the *Nightingale Pipe* of a *Regal*, and in a *Discord* straight falling upon a *Concord*: But if you stay upon it, it is *offensive*. And therefore there be these three degrees of *pleasing* and *displeasing* in *Sounds*: *Sweet sounds*, *Discords*, and *Harsh sounds*, which we call by *divers names*, as *scritchings*, or *Grating*, such as we now speak of. As for the *setting* of the *Teeth* on edge, we plainly see what an intercourse there is between the *Teeth*, and the *Organ* of the *Hearing*, by the taking of the end of a *Bow* between the *Teeth*, and *striking* upon the *String*.

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NATURAL HISTORY;

Century VIII.



Here be *Minerals* and *Fossiles* in great variety, but of *Veins of Earth Medicinal* but few. The chief are, *Terra Lemnia*, *Terra Sigillata communis*, and *Bolus Arminus*; whereof *Terra Lemnia* is the chief. The *Vertues* of them are for *Curing of Wounds*, *Stanching of Blood*, *Stopping of Fluxes and Rheums*, and *Arresting the Spreading of Poyson, Infection, and Putrefaction*: And they have of all other *Simples* the perfectest and purest quality of *Drying* with little or no mixture of any other quality. Yet it is true, that the *Bole-Arminick* is the most cold of them, and that *Terra Lemnia* is the most hot; for which cause the *Island Lemnos* where it is digged, was in the old *Fabulous Ages* consecrated to *Vulcan*.

About the *Bottom* of the *Straights* are gathered great quantities of *Sponges*, which are gathered from the *sides of Rocks*, being as it were a large, but tough *Moss*. It is the more to be noted, because that there be but few *Substances, Plant-like*, that grow deep within the *Sea*, for they are gathered sometime *Fifteen fathom deep*. And when they are laid on *Shore*, they seem to be of great *Bulk*; but crushed together, will be transported in a very small room.

It seemeth that *Fish*, that are used to the *Salt-water*, do nevertheless delight more in *fresh*. We see that *Salmons* and *Smelts* love to get into *Rivers*, though it be against the *stream*. At the *Haven of Constantinople* you shall have great quantities of *Fish* that come from the *Euxine Sea*, that when they come into the *Fresh-water*, do inebriate and turn up their *Bellies*, so as you may take them with your hand. I doubt there hath not been sufficient Ex-

701.
Experiment
Solitary,
touching
Veins of Medi-
cinal Earth.

702.
Experiment
Solitary,
touching the
Growth of
Sponges.

703.
Experiment
Solitary,
touching
Sea Fish put
in Fresh wa-
ter.

periment made of putting *Sea-fish* into *Fresh-water*, *Ponds*, and *Pools*. It is a thing of great use and pleasure; for so you may have them new at some good distance from the *Sea*: And besides, it may be the *Fish* will eat the pleasanter, and may fall to breed. And it is said, that *Colchester Oysters*, which are put into *Pits*, where the *Sea* goeth and cometh, (but yet so that there is a *Fresh-water* coming also to them when the *Sea* voideth) become by that means fatter, and more grown.

704.
Experiments
Solitary,
touching
Attraction by
Similitude of
Substance.

The *Turkish Bow* giveth a very forcible *shoot*, insomuch as it hath been known, that the *Arrow* hath pierced a *Steel Target*, or a piece of *Brass* of two Inches thick: But that which is more strange, the *Arrow*, if it be headed with *Wood*, hath been known to pierce through a piece of *Wood* of eight Inches thick. And it is certain, that we had in use at one time, for *Sea-fight*, short *Arrows*, which they called *Sprights*, without any other Heads, save *Wood* sharpened; which were discharged out of *Muskets*, and would pierce through the sides of *Ships*, where a *Bullet* would not pierce. But this dependeth upon one of the greatest secrets in all *Nature*; which is, that *Similitude* of *Substance* will cause *Attraction*, where the *Body* is wholly freed from the *Motion* of *Gravity*: For if that were taken away, *Lead* would draw *Lead*, and *Gold* would draw *Gold*, and *Iron* would draw *Iron* without the help of the *Load stone*. But this same *Motion* of *Weight* or *Gravity*, (which is a meer *Motion* of the *Matter*, and hath no affinity with the *Form* or *Kind*), doth kill the other *Motion*, except it self be killed by a violent *Motion*; as in these instances of *Arrows*, for then the *Motion* of *Attraction* by *Similitude* of *Substance* beginneth to shew it self. But we shall handle this point of *Nature* fully in due place.

705.
Experiment
Solitary,
touching
Certain drinks
in Turkey.

They have in *Turky*, and the *East*, certain *Confections*, which they call *Servets*, which are like to *Candid Conerves*, and are made of *Sugar* and *Lemons*, or *Sugar* and *Citrons*, or *Sugar* and *Violets*, and some other *Flowers*; and some mixture of *Amber* for the more delicate persons: And those they dissolve in *Water*, and thereof make their *Drink*, because they are forbidden *Wine* by their *Law*. But I do much marvel, that no *Englishman*, or *Dutchman*, or *German*, doth set up *Brewing* in *Constantinople*, considering they have such quantity of *Barley*. For as for the general sort of *Men*, frugality may be the cause of *Drinking Water*; for that it is no small saving to pay nothing for ones *drink*: But the better sort might well be at the cost. And yet I wonder the less at it, because I see *France*, *Italy*, or *Spain* have not taken into use *Beer* or *Ale*; which (perhaps) if they did, would better both their *Healths* and their *Complexions*. It is likely it would be matter of great gain to any that should begin it in *Turkey*.

706.
Experiments
in Confort,
touching
Sweat.

In *Bathing* in *hot water*, *sweat* (nevertheless) cometh not in the parts under the *Water*. The cause is, first, for that *sweat* is a kind of *Colligation*. And that kind of *colligation* is not made either by an *over-dry* Heat, or an *over-moist* Heat. For *over-moisture* doth somewhat extinguish the Heat; as we see, that even *hot water* quencheth *Fire*, and *over-dry* Heat shutteth the *Pores*. And therefore *Men* will sooner *sweat* covered before the *Sun* or *Fire*, than if they stood naked: And *Earthen Bottles* filled with *hot water*, do provoke in Bed a *Sweat* more daintily than *Brick* bath hot. Secondly, *Hot water* doth cause *Evaporation* from the *Skin*; so as it spendeth the matter in those parts under the *Water*, before it issueth in *Sweat*.

Sweat. Again, *Sweat* cometh more plentifully, if the *Heat* be increased by *degrees*, than if it be greatest at first, or equal. The *cause* is, for that the *Pores* are better opened by a *gentle Heat*, than by a more *violent*; and by their opening the *Sweat* issueth more abundantly. And therefore *Physicians* may do well, when they provoke *Sweat* in Bed by *Bottles*, with a *Decoction* of *Sudorifick Herbs* in *Hot Water*, to make two *degrees* of *Heat* in the *Bottles*, and to lay in the Bed the *less heated* first, and after half an hour the *more heated*.

Sweat is *salt* in taste. The *cause* is, for that that part of the *Nourishment* which is *fresh* and *sweet*, turneth into *Blood* and *Flesh*; and the *Sweat* is only that *part* which is *separate* and *excerned*. *Blood* also raw, hath some *saltiness* more than *Flesh*, because the *Assimilation* into *Flesh*, is not without a little and *subtile excretion* from the *Blood*.

Sweat cometh forth more out of the *upper parts* of the *Body* than the *lower*. The *reason* is, because those *parts* are more replenished with *Spirits*, and the *Spirits* are they that put forth *Sweat*; besides, they are *less fleshy*, and *Sweat* issueth (chiefly) out of the *parts* that are *less fleshy* and more *dry*, as the *Forehead* and *Breast*.

Men sweat more in *sleep* than *waking*, and yet *sleep* doth rather stay other *Fluxions*, than cause them; as *Rheums*, *Looseness* of the *Body*, &c. The *cause* is, for that in *Sleep* the *Heat* and *Spirits* do naturally move inwards, and there rest. But when they are collected once within, the *Heat* becometh more *violent* and *irritate*, and thereby expelleth *Sweat*.

Cold Sweats are (many times) *Mortal* and near *Death*, and always *ill* and *suspected*, as in great *Fears*, *Hypochondriacal Passions*, &c. The *cause* is, for that *Cold Sweats* come by a *relaxation* or *forsaking* of the *Spirits*, whereby the *Moisture* of the *Body*, which *Heat* did keep firm in the *parts*, severeth and issueth out.

In those *Diseases* which cannot be discharged by *Sweat*, *Sweat* is *ill*, and rather to be stayed; as in *Diseases* of the *Lungs*, and *Fluxes* of the *Belly*; but in those *Diseases* which are expelled by *Sweat*, it easeth and lighteneth; as in *Agues*, *Pestilences*, &c. The *cause* is, for that *Sweat* in the latter sort is partly *Critical*, and sendeth forth the *Matter* that offendeth: But in the former, it either proceedeth from the *Labor* of the *Spirits*, which sheweth them oppressed; or from *Motion* of *Consent*, when *Nature* not able to expel the *Disease* where it is seated, moveth to an *Expulsion* indifferent over all the *Body*.

The *Nature* of the *Glo-worm* is hitherto not well observed. Thus much we see, that they breed chiefly in the *hottest Months* of *Summer*; and that they breed not in *Champaign*, but in *Bushes* and *Hedges*. Whereby it may be conceived, that the *Spirit* of them is very *fine*, and not to be refined but by *Summer heats*. And again, that by reason of the *fineness*, it doth easily exhale. In *Italy*, and the *Hotter Countreys*, there is a *Fly* they call *Lucciole*, that shineth as the *Glo-worm* doth, and it may be is the *Flying-Glo-worm*; but that *Fly* is chiefly upon *Fens* and *Marishes*. But yet the two former observations hold, for they are not seen but in the *heat* of *Summer*; and *Sedge*, or other *Green* of the *Fens* give as good shade as *Bushes*. It may be the *Glo-worms* of the *Cold Countreys* ripen not so far as to be winged.

The *Passions* of the *Mind*, work upon the *Body* the *impressions* following. *Fear*, causeth *Paleness*, *Trembling*, the *Standing* of the *Hair* up-
right,

707.

708.

709.

710.

711.

712.

Experiment
Solitary,
touching the
Glo worm.

713.

Experiments
in Consort,
touching the
Impressions
which the *Passions*
of the
Mind make
upon the *Body*.

right Starting, and Screeching. The Paleness is caused, for that the Blood runneth inward to succor the Heart. The Trembling is caused, for that through the flight of the Spirits inward, the outward parts are destituted, and not sustained. Standing upright of the Hair is caused, for that by shutting of the Pores of the Skin, the Hair that lyeth aloop must needs rise. Starting is both an apprehension of the thing feared, (and in that kind it is a motion of shrinking,) and likewise an Inquisition in the beginning what the matter should be, (and in that kind it is a motion of Erection;) and therefore when a Man would listen suddenly to any thing, he starteth; for the starting is an Erection of the Spirits to attend. Screeching is an appetite of expelling that which suddenly striketh the Spirits. For it must be noted, that many Motions, though they be unprofitable to expel that which hurteth, yet they are Offers of Nature, and cause Motions by Consent; as in Groaning, or Crying upon Pain.

714. Grief and Pain, cause Sighing, Sobbing, Groaning, Screaming, and Roaring, Tears, Distorting of the Face, Grinding of the Teeth, Sweating. Sighing is caused by the drawing in of a greater quantity of Breath to refresh the Heart that laboureth; like a great draught when one is thirsty. Sobbing is the same thing stronger. Groaning, and Screaming, and Roaring, are caused by an appetite of Expulsion, as hath been said; for when the Spirits cannot expel the thing that hurteth in their strife to do it, by Motion of Consent they expel the Voice. And this is when the Spirits yield, and give over to resist; for if one do constantly resist Pain, he will not groan. Tears are caused by a Contraction of the Spirits of the Brain, which Contraction by consequence astringeth the Moisture of the Brain, and thereby sendeth Tears into the Eyes. And this Contraction or Compression causeth also Wringing of the Hands; for Wringing is a Gesture of Expression of Moisture. The Distorting of the Face is caused by a Contention, first, to bear and resist, and then to expel; which maketh the Parts knit first, and afterwards open. Grinding of the Teeth is caused (likewise) by a Gathering and Serring of the Spirits together to resist; which maketh the Teeth also to set hard one against another. Sweating is also a Compound Motion by the Labor of the Spirits, first to resist, and then to expel.

715. Joy causeth a Chearfulness and Vigor in the Eyes, Singing, Leaping, Dancing, and sometimes Tears. All these are the effects of Dilatation and coming forth of the Spirits into the outward parts, which maketh them more lively and stirring. We know it hath been seen, that Excessive sudden Joy hath caused present Death, while the Spirits did spread to much as they could not retire again. As for Tears, they are the effects of Compression of the Moisture of the Brain, upon Dilatation of the Spirits. For Compression of the Spirits worketh an Expression of the Moisture of the Brain by consent, as hath been said in Grief. But then in Joy it worketh it diversly, viz. By Propulsion of the Moisture, when the Spirits dilate, and occupy more room.

716. Anger causeth Paleness in some, and the going and coming of the colour in others; also Trembling in some, Swelling, Foaming at the Mouth, Stamping, Bending of the Fist. Paleness, and Going, and Coming of the Colour, are caused by the Burning of the Spirits about the Heart; which to refresh themselves, call in more Spirits from the outward parts. And if the Paleness be alone, without sending forth the colour again, it is commonly joyned with some fear: but in many there is no Paleness at all, but contrarywise Redness about the Cheeks and Gills, which is by the sending forth of the Spirits.

Spirits, in an appetite to *Revenge*. Trembling in *Anger* is likewise by a calling in of the *Spirits*, and is commonly when *Anger* is joyned with *Fear*. Swelling is caused both by a Dilatation of the *Spirits* by over-heating, and by a Liquefaction or Boiling of the *Humors* thereupon. Foaming at the Mouth is from the same cause, being an Ebullition. Stamping and Bending of the *Fist* are caused by an Imagination of the Act of *Revenge*.

Light Displeasure or Dislike causeth shaking of the Head Frowning, and Knitting of the Brows. These effects arise from the same causes that Trembling and Horror do; namely, from the Retiring of the *Spirits*, but in a less degree. For the shaking of the Head, is but a slow and definite Trembling; and is a Gesture of slight refusal: And we see also, that a dislike causeth often that Gesture of the Hand, which we use when we refuse a thing, or warn it away. The Frowning and Knitting of the Brows, is a Gathering or Serring of the *Spirits*, to resist in some measure. And we see also, this Knitting of the Brows will follow upon earnest Studying, or Cogitation of any thing, though it be without dislike.

Shame causeth Blushing, and casting down of the Eyes. Blushing is the Resort of Blood to the Face, which in the Passion of Shame, is the part that laboreth most. And although the Blushing will be seen in the whole Breast, if it be naked, yet that is but in passage to the Face. As for the casting down of the Eyes, it proceedeth of the Reverence a Man beareth to other Men, whereby, when he is ashamed, he cannot endure to look firmly upon others: And we see, that Blushing and the Casting down of the Eyes both, are more when we come before many; *Ore Pompeii quid mollius: Nunquam non coram pluribus erubuit*; and likewise, when we come before Great or Reverend Persons.

Pity causeth sometimes Tears, and a Flexion or Cast of the Eye aside. Tears come from the same cause, that they do in Grief: For Pity is but Grief in another's behalf. The Cast of the Eye, is a Gesture of Aversion or Loathsomeness to behold the object of Pity.

Wonder causeth Astonishment, or an Immovable Posture of the Body, Casting up of the Eyes to Heaven, and Lifting up of the Hands. For Astonishment, it is caused by the Fixing of the Mind upon one object of Cogitation, whereby it doth not spaciately and transcur as it useth: For in Wonder the *Spirits* fly not, as in Fear; but only settle, and are made less apt to move. As for the Casting up of the Eyes, and Lifting up of the Hands, it is a kind of Appeal to the Deity, which is the Author, by Power and Providence of strange Wonders.

Laughing causeth a Dilatation of the Mouth and Lips; a continued Expulsion of the Breath, with the loud Noise, which maketh the Interjection of Laughing; Shaking of the Breast and Sides; Running of the Eyes with Water, if it be violent and continued. Wherein first it is to be understood, that Laughing is scarce (properly) a Passion, but hath his Source from the Intellect; for in Laughing, there ever precedeth a conceit of somewhat ridiculous. And therefore it is proper to Man. Secondly, that the cause of Laughing, is but a light touch of the *Spirits*, and not so deep an Impression as in other Passions. And therefore (that which hath no Affinity with the Passions of the Mind) it is moved, and that in great vehemency, only by Tickling some parts of the Body. And we see, that Men even in a grieved State of Mind, yet cannot sometimes forbear Laughing. Thirdly, it is ever joyned with some degree of Delight. And therefore Exhilaration hath some Affinity with Joy, though it be a much Lighter Motion. *Res severa est verum Gaudium*. Fourthly,

717.

718.

719.

720.

721.

Fourthly, That the *object* of it is *Deformity*, *Absurdity*, *Shrewd turns*, and the like. Now to speak of the *causes* of the *effects* before-mentioned, whereunto these *general Notes* give some *light*. For the *Dilatation* of the *Mouth* and *Lips*, continued *Expulsion* of the *Breath* and *Voice*, and *Shaking* of the *Breast*, and *Sides*, they proceed (all) from the *Dilatation* of the *Spirits*, especially being sudden. So likewise the *Running* of the *Eyes* with *Water*, (as hath been formerly touched, where we speak of the *Tears* of *Joy* and *Grief*) is an effect of *Dilatation* of the *Spirits*. And for *Suddenness*, it is a great part of the *Matter*: For we see that any *Shrewd turn* that lighteth upon another, or any *Deformity*, &c. moveth *Laughter* in the instant, which after a little time it doth not. So we cannot *Laugh* at any thing after it is *stale*, but whilest it is *new*. And even in *Tickling*, if you *tickle* the *sides*, and give warning, or give a *hard* or *continued touch*, it doth not move *Laughter* so much.

722.

Lust causeth a *Flagrancy* in the *Eyes*, and *Priapism*. The *cause* of both these is, for that in *Lust* the *Sight* and the *Touch*, are the things desired; and therefore the *Spirits* resort to those parts which are most affected. And note well in general, (for that great use may be made of the *observation*) that (evermore) the *Spirits* in all *Passions* resort most to the *parts* that labour most, or are most affected. As in the last, which hath been mentioned, they resort to the *Eyes* and *Venerous parts*; in *Fear* and *Anger* to the *Heart*; in *Shame* to the *Face*; and in *Light dislikes* to the *Head*.

723.

Experiments
in Confort,
touching
Drunkenness.

It hath been observed by the *Ancients*, and is yet believed, That the *sperru* of *Drunken-men* is unfruitful. The *cause* is, for that it is *over-moistned*, and wanteth *Spissitude*. And we have a merry saying, That they that go drunk to Bed, get *Daughters*.

724.

Drunken-men are taken with a plain *Defect* or *Destitution* in *Voluntary Motion*; they reel, they tremble, they cannot stand, nor speak strongly. The *cause* is, for that the *Spirits* of the *Wine* oppress the *Spirits Animal* and occupy part of the place where they are, and so make them weak to move; and therefore *Drunken-men* are apt to fall asleep. And *Opiates* and *Stupefatives* (as *Poppy*, *Henbane*, *Hemlock*, &c.) induce a kind of *Drunkenness* by the grossness of their *Vapor*, as *Wine* doth by the *quantity* of the *Vapor*. Besides, they rob the *Spirits Animal* of their *Matter* whereby they are nourished; for the *Spirits* of the *Wine*, prey upon it as well as they, and so they make the *Spirits* less supple and apt to move.

725.

Drunken-men imagine every thing turneth round; they imagine also, that things come upon them; they see not well things afar off; those things that they see near hand, they see out of their place; and (sometimes) they see things double. The *cause* of the imagination that things turn round, is, for that the *Spirits* themselves turn, being compressed by the *vapor* of the *Wine*; (for any *Liquid Body* upon *Compression* turneth, as we see in *Water*.) And it is all one to the *sight*, whether the *Visual Spirits* move, or the *Object* moveth, or the *Medium* moveth; and we see, that long turning round breedeth the same imagination. The *cause* of the imagination that things come upon them, is, for that the *Spirits Visual* themselves draw back, which maketh the *Object* seem to come on; and besides, when they see things turn round and move, *Fear* maketh them think they come upon them. The *cause* that they cannot see things afar off, is the *weakness* of the *Spirits*: for in every *Megrim* or *Vertigo*, there is an *Obtenebration* joyned with a semblance of *Turning round*, which we see also in the lighter sort of *Swoonings*.
The

The cause of seeing things out of their place, is the refraction of the Spirits visual; for the vapor is an unequal Medium, and it is as the sight of things out of place in Water. The cause of seeing things double, is the swift and unquiet motion of the Spirits (being oppressed) to and fro; for (as was said before) the motion of the Spirits visual, and the motion of the object, make the same appearances; and for the swift motion of the object; we see that if you fillip a Lute string, it sheweth double or treble.

Men are sooner Drunk with small draughts than with great. And again, Wine sugred, inebriateth less than Wine pure. The cause of the former is, for that the Wine descendeth not so fast to the Bottom of the Stomack, but maketh longer stay in the upper part of the Stomack, and sendeth Vapors faster to the Head, and therefore inebriateth sooner. And for the same reason, Sops in Wine quantity for quantity inebriate more than Wine of it self. The cause of the latter is, for that the Sugar doth inspissate the Spirits of the Wine, and maketh them not so easie to resolve into Vapor. Nay further, it is thought to be some remedy against inebriating, if Wine sugred be taken after Wine pure. And the same effect is wrought, either by Oyl or Milk taken upon much Drinking.

726.

THe use of Wine in dry and consumed Bodies is hurtful, in moist and full Bodies it is good. The cause is, for that the Spirits of the Wine do prey upon the Dew or radical moisture (as they term it) of the Body, and so deceive the Animal spirits. But where there is moisture enough, or superfluous, there Wine helpeth to digest and desiccate the moisture.

727.
Experiment Solitary, touching the Help or hurt of Wine, though Moderately used.

THe Catterpillar is one of the most general of Worms, and breedeth of Dew and Leaves; for we see infinite number of Catterpillers which breed upon Trees and Hedges, by which the Leaves of the Trees or Hedges are in great part consumed; as well by their breeding out of the Leaf, as by their feeding upon the Leaf. They breed in the Spring chiefly, because then there is both Dew and Leaf. And they breed commonly when the East Winds have much blown: The cause whereof is, the dryness of that Wind; for to all Vivification upon Putrefaction, it is requisite the matter be not too moist: And therefore we see they have Cobwebs about them, which is a sign of a slimy dryness; as we see upon the Ground, whereupon by Dew and Sun Cobwebs breed all over. We see also the Green Catterpillar breedeth in the inward parts of Roses, especially not blown where the Dew stickest: But especially Catterpillers, both the greatest and the most breed upon Cabbages, which have a fat Leaf, and apt to putrefie. The Catterpillar toward the end of Summer waxeth volatile, and turneth to a Butterflie, or perhaps some other Flie. There is a Catterpillar that hath a Fur or Down upon him, and seemeth to have affinity with the Silk-worm.

728.
Experiment Solitary, touching Catterpillers.

THe Flies Cantharides, are bred of a Worm or Catterpillar, but peculiar to certain Fruit trees; as are the Fig-tree, the Pine-tree, and the Wild Bryar, all which bear sweet Fruit, and Fruit that hath a kind of secret biting or sharpness. For the Fig hath a Milk in it that is sweet and corrosive; the Pine-Apple hath a Kernel that is strong and abstersive; the Fruit of the Bryar is said to make Children, or those that eat them, scabbed. And therefore no marvel though Cantharides have such a Corrosive and Cantherizing quality; for there is not any other of the Insecta, but is bred of a duller matter. The Body of the Cantharides is bright coloured; and it may

729.
Experiment Solitary, touching the Flies Cantharides.

be,

be, that the delicate coloured *Dragon Flies* may have likewise some *Corrosive* quality.

730.
Experiments
in Comfort,
touching
Lassitude.

L *Affitude* is remedied by *Bathing* or *Anointing* with *Oyl* and *warm Water*. The cause is, for that all *Lassitude* is a kind of *Contusion* and *Compression* of the *Parts*; and *Bathing* or *Anointing* give a *Relaxion* or *Emollition*: And the mixture of *Oyl* and *Water* is better than either of them alone, because *Water* entrencheth better into the *Pores*, and *Oyl* after entry softneth better. It is found also, that the taking of *Tobacco* doth help and discharge *Lassitude*. The reason whereof is partly, because by chearing or comforting of the *Spirits*, it openeth the *Parts* compressed or confused: And chiefly, because it refresheth the *Spirits* by the *Opiate Vertue* thereof, and so dischargeth *Weariness*, as *Sleep* likewise doth.

731.

In going up a *Hill* the *Knees* will be most weary; In going down a *Hill*, the *Thighs*. The cause is, for that in the *Lift* of the *Feet*, when a man goeth up the *Hill*, the weight of the *Body* beareth most upon the *Knees*; and in going down the *Hill*, upon the *Thighs*.

732.
Experiment
Solitary,
touching the
Casting of the
Skin and *Shell*
in some *Crea-*
tures.

The casting of the *Skin*, is by the *Ancients* compared to the breaking of the *Secundine* or *Call*, but not rightly; for that were to make every casting of the *Skin* a new *Birth*: And besides, the *Secundine* is but a general *Cover*, not shaped according to the *Parts*; but the *Skin* is shaped according to the *Parts*. The *Creatures* that cast their *Skin* are, the *Snake*, the *Viper*, the *Grasshopper*, the *Lizard*, the *Silk-worm*, &c. Those that cast their *Shell* are, the *Lobster*, the *Crab*, the *Cra-fish*, the *Hodmandod* or *Dedman*, the *Tortoise*, &c. The old *Skins* are found, but the old *Shells* never: So as it is like they scale off, and crumble away by degrees. And they are known by the extreame tenderness and softness of the new *Shell*; and somewhat by the freshness of the colour of it. The cause of the casting of *Skin* and *Shell* should seem to be the great quantity of matter in those *Creatures*, that is fit to make *Skin* or *Shell*: And again, the looseness of the *Skin* or *Shell*, that sticketh not close to the *Flesh*. For it is certain, that it is the new *Skin* or *Shell*, that putteth off the old. So we see that in *Deer*, it is the young *Horn* that putteth off the old. And in *Birds*, the young *Feathers* put off the old; and so *Birds* that have much matter for their *Beak*, cast their *Beaks*, the new *Beak* putting off the old.

733.
Experiment
in Comfort,
touching
Postures of the
Body.

Lying not *Erect* but *Hollow*, which is in the making of the *Bed*, or with the *Legs* gathered up, which is in the posture of the *Body*, is the more wholesome. The reason is, the better comforting of the *Stomach*, which is by that less pensile; and we see that in weak *Stomachs*, the laying up of the *Legs* high, and the *Knees* almost to the *Mouth*, helpeth and comforteth. We see also, that *Gally-slaves*, notwithstanding their misery otherwise, are commonly fat and fleshy; and the reason is, because the *Stomach* is supported somewhat in sitting, and is pensile in standing or going. And therefore for *Prolongation* of *Life*, it is good to chuse those *Exercises* where the *Limbs* move more than the *Stomach* and *Belly*; as in *Rowing* and in *Sawing*, being set.

734.

Megrims and *Giddiness* are rather when we *Rise*, after long sitting, than while we sit. The cause is, for that the *Vapors* which were gathered by sitting, by the sudden *Motion* flie more up into the *Head*.

735.

Leaning long upon any *Part* maketh it *Num*, and, as we call it, A sleep. The

The cause is, for that the *Compression* of the Part suffereth not the *Spirits* to have free access; and therefore, when we come out of it, we feel a *stinging* or *pricking*, which is the re-entrance of the *Spirits*.

It hath been noted, That those *Tears* are *pestilential* and *unwholsome*, when there are great numbers of *Frogs*, *Flies*, *Locusts*, &c. The cause is plain; for that those Creatures being ingendred of *Putrefaction*, when they abound, shew a general disposition of the *Year*, and constitution of the *Air* to *Diseases* of *Putrefaction*. And the same *Frognostick* (as hath been said before) holdeth, if you find *Worms* in *Oak-Apples*. For the *Constitution* of the *Air* appeareth more subtilly in any of these things, than to the sense of *Man*.

It is an observation amongst *Country-people*, that *Tears* of *store* of *Haws* and *Heps*, do commonly portend *cold Vinters*; and they ascribe it to *Gods Providence*, that (as the *Scripture* saith) reacheth even to the *falling* of a *Sparrow*; and much more is like to reach to the *Preservation* of *Birds* in such *Seasons*. The *Natural cause* also may be the want of *Heat*, and abundance of *Moisture* in the *Summer* precedent, which putteth forth those *Fruits*, and must needs leave great quantity of *cold Vapors* not dissipate, which causeth the *cold* of the *Winter* following.

They have in *Turkey* a *Drink* called *Coffee*, made of a *Berry* of the same name, as black as *Soot*, and of a *strong sent*, but not *aromatical*, which they take, beaten into powder, in *Water* as hot as they can drink it: And they take it, and sit at it in their *Coffee-Houses*, which are like our *Taverns*. This *Drink* comforteth the *Brain* and *Heart*, and helpeth *Digestion*. Certainly this *Berry-Coffee*, the *Root* and *Leaf Betel*, the *Leaf Tobacco*, and the *Tear of Poppy*, (*Opium*) of which, the *Turks* are great takers (supposing it expelleth all fear); do all condense the *Spirits*, and make them strong and aliger. But it seemeth they are taken after several manners; for *Coffee* and *Opium* are taken down, *Tobacco* but in *Smook*, and *Betel* is but champed in the *Mouth* with a little *Lime*. It is like, there are more of them, if they were well found out, and well corrected. *Quere*, of *Henbane seed*, of *Mandrake*, of *Saffron*, *Root* and *Flower*, of *Folium Indum*, of *Ambergreece*, of the *Assyrian Amomum*, if it may be had, and of the *Scarlet Powder* which they call *Kermes*; and (generally) of all such things as do inebriate and provoke sleep. Note, that *Tobacco* is not taken in *Root* or *Seed*, which are more forcible ever than *Leaves*.

The *Turks* have a *black Powder* made of a *Mineral* called *Alcobole*, which with a fine long *Pencil* they lay under their *Eye-lids*, which doth colour them black, whereby the *White* of the *Eye* is set off more *white*. With the same *Powder* they colour also the *Hairs* of their *Eye-lids*, and of their *Eye-brows*, which they draw into embowed *Arches*. You shall find that *Xenophon* maketh mention, that the *Medes* used to paint their *Eyes*. The *Turks* use with the same *Tincture* to colour the *Hair* of their *Heads* and *Beards* black: And divers with us that are grown *Gray*, and yet would appear young, find means to make their *Hair* black, by combing it (as they say) with a *Leaden Comb*, or the like. As for the *Chineses*, who are of an ill *Complexion*, (being *Olivafter*) they paint their *Cheeks* *Scarlet*, especially their *King* and *Grandees*. Generally, *Barbarous People* that go naked, do not only paint them-

736.

Experiment
Solitary,
touching
Pestilential
Tears.

737.

Experiment
Solitary,
touching the
Pregnosticks of
Hard Winters.

738.

Experiment
Solitary,
touching
Medicines that
Condense and
Relieve the
Spirits.

739.

Experiment
Solitary,
touching
Paintings of
the *Body*.

themselves, but they pounce and rase their skin, that the *Painting* may not be taken forth, and make it into Works: So do the *West-Indians*, and so did the ancient *Picts* and *Britons*. So that it seemeth, *Men* would have the colours of *Birds Feathers*, if they could tell how, or at least, they will have *gay Skins* in stead of *gay Clouths*.

740.

Experiment
Solitary,
touching the
Use of Bath-
ing and Anoin-
ing.

It is strange that the use of *Bathing*, as a part of *Diet*, is left. With the *Romans* and *Grecians* it was as usual, as *Eating* or *Sleeping*; and so is it amongst the *Turks* at this day; whereas with us it remaineth but as a part of *Physick*. I am of opinion, that the use of it, as it was with the *Romans*, was hurtful to health; for that it made the *Body* soft and easie to waste. For the *Turks* it is more proper, because their *drinking Water*, and *feeding* upon *Rice*, and other Food of small nourishment, maketh their *Bodies* so solid and hard, as you need not fear that *Bathing* should make them frothy. Besides, the *Turks* are great *sitters*, and seldom walk; whereby they sweat less, and need *Bathing* more. But yet certain it is, that *Bathing*, and especially *Anointing*, may be so used, as it may be a great help to *Health*, and *Prolongation of Life*. But hereof we shall speak in due place, when we come to handle *Experiments Medicinal*.

741.

Experiments
Solitary,
touching
Chamoletting
of Paper.

The *Turks* have a pretty Art of *Chamoletting* of *Paper*, which is not with us in use. They take divers *Oyled Colours*, and put them severally (in drops) upon *Water*, and stir the *Water* lightly, and then wet their *Paper* (being of some thickness) with it; and the *Paper* will be waved and veined like *Chamolet*, or *Marble*.

742.

Experiment
Solitary,
touching
Cuttle-Ink

It is somewhat strange, that the *Blood* of all *Birds*, and *Beasts*, and *Fishes*, should be of a *Red colour*, and only the *Blood* of the *Cuttle* should be as *black as Ink*. A man would think that the cause should be the *high Concoction* of that *Blood*; for we see in ordinary *Puddings*, that the *Boyling* turneth the *Blood* to be *black*; and the *Cuttle* is accounted a delicate *Meat*, and is much in request.

743.

Experiments
Solitary,
touching
Increase of
Weight in
Earth.

It is reported of credit, That if you take *Earth* from Land adjoyning to the *River of Nile*, and preserve it in that manner, that it neither come to be wet nor wasted, and weigh it daily, it will not alter *weight* until the Seventeenth of *June*, which is the day when the *River* beginneth to rise, and then it will grow more and more *ponderous* till the *River* cometh to his height. Which, if it be true, it cannot be caused but by the *Air*, which then beginneth to condense; and so turneth within that small *Mould* into a degree of *Moisture*, which produceth weight. So it hath been observed, that *Tobacco* cut and weighed, and then dried by the *Fire*, loseth weight; and after being laid in the open *Air*, recovereth *weight* again. And it should seem, that as soon as ever the *River* beginneth to increase, the whole *Body* of the *Air* thereabouts suffereth a change: For (that which is more strange) it is credibly affirmed, that upon that very day, when the *River* first riseth, great *Plagues* in *Cairo* use suddenly to break up.

744.

Experiments
in Consort
touching
Sleep.

Those that are very *cold*, and especially in their *Feet*, cannot get to *sleep*. The cause may be, for that in *Sleep* is required a *free respiration*, which *cold* doth shut in and hinder: For we see, that in great *Colds*, one can scarce draw

draw his *Breath*. Another *cause* may be, for that *Cold* calleth the *Spirits* to succor, and therefore they cannot so well close, and go together in the *Head*, which is ever requisite to *Sleep*. And for the same *cause*, *Pain* and *noise* hinder *sleep*, and *darkness* (contrariwise) furthereth *sleep*.

Some *noises*, (whereof we spake in the 112 *Experiment*) help *Sleep*; as the blowing of the *Wind*, the trickling of *Water*, humming of *Bees*, soft singing, reading, &c. The *cause* is, for that they move in the *Spirits* a gentle *attention*; and whatsoever moveth *attention*, without too much labor; stilleth the natural and discursive *motion* of the *Spirits*.

Sleep nourisheth, or at least preserveth *Bodies*, a long time, without other *nourishment*. *Beasts* that sleep in *Winter*, (as it is noted of *wild Bears*) during their *sleep* wax very fat, though they eat nothing. *Bats* have been found in *Ovens*, and other hollow close places, matted one upon another; and therefore it is likely that they sleep in the *Winter* time, and eat nothing. *Quere* whether *Bees* do not sleep all *Winter*, and spare their *Honey*. *Butter-flies*, and other *Flies*, do not only sleep, but lie as dead all *Winter*; and yet with a little heat of *Sun* or *Fire* revive again. A *Dormouse*, both *Winter* and *Summer* will sleep some days together, and eat nothing.

TO restore *Teeth* in *Age*, were *Magnale Naturæ*, it may be thought of; but howsoever, the *nature* of the *Teeth* deserveth to be enquired of, as well as the other parts of *Living Creatures Bodies*.

There be five parts in the *Bodies* of *Living Creatures* that are of *hard substance*; the *Skull*, the *Teeth*, the *Bones*, the *Horns*, and the *Nails*. The greatest quantity of *hard substance* continued, is towards the *Head*; for there is the *Skull* of one entire *Bone*, there are the *Teeth*, there are the *Maxillary Bones*, there is the *hard Bone*, that is, the *Instrument* of *Hearing*, and thence issue the *Horns*. So that the building of *Living Creatures Bodies* is like the building of a *Timber-house*, where the *Walls* and other parts have *Columns* and *Beams*; but the *Roof* is in the better sort of *Houses*, all *Tile*, or *Lead*, or *Stone*. As for *Birds*, they have three other *hard substances* proper to them; the *Bill*, which is of like matter with the *Teeth*, for no *Birds* have *Teeth*; the *Shell* of the *Egg*, and their *Quills*; for as for their *spur*, it is but a *Nail*. But no *Living Creatures* that have *Shells* very hard (as *Oysters*, *Cockles*, *Mussels*, *Scalops*, *Crabs*, *Lobsters*, *Craw-fish*, *Shrimp*, and especially the *Tortoise*) have *Bones* within them, but only little *Gristles*.

Bones, after full growth, continue at a stay, and so doth the *Skull*. *Horns*, in some *Creatures* are cast and renewed: *Teeth* stand at a stay, except their wearing. As for *Nails*, they grow continually, and *Bills* and *Beaks* will overgrow, and sometimes be cast, as in *Eagles* and *Parrots*.

Most of the *hard substances* fly to the extreame of the *Body*; as *Skull*, *Horns*, *Teeth*, *Nails*, and *Beaks*; only the *Bones* are more inward, and clad with *Flesh*. As for the *Entrails*, they are all without *Bones*, save that a *Bone* is sometimes found in the *Heart* of a *Stag*, and it may be in some other *Creature*.

The *Skull* hath *Brains*, as a kind of *Marrow* within it. The *Back-bone* hath one kind of *Marrow*, which hath an affinity with the *Brain*; and other *Bones* of the *Body* have another. The *Jaw-bones* have no *Marrow* severed, but a little *Pulp* of *Marrow* diffused. *Teeth* likewise are thought to have a kind of *Marrow* diffused, which causeth the *Sense* and *Pain*: But it

745.

746.

747.
Experiments
in Confort,
touching
Teeth and
hard Substan-
ces in the
Bodies of Li-
ving Crea-
tures,

748.

749.

750.

is rather *Sinew*; for *Marrow* hath no *Sense*, no more than *Blood*. *Horn* is alike throughout, and so is the *Nail*.

751. None other of the *hard substances* have *Sense*, but the *Teeth*, and the *Teeth* have *Sense*, not only of *Pain*, but of *Cold*.

But we will leave the *Enquiries* of other *Hard Substances* unto their several places, and now enquire only of the *Teeth*.

752. The *Teeth* are in *Men* of three kinds, *Sharp*, as the *Fore-teeth*; *Broad*, as the *Back-teeth*, which we call the *Molar-teeth*, or *Grinders*; and *Pointed-teeth*, or *Canine*, which are between both. But there have been some *Men* that have had their *Teeth* undivided, as of one whole *Bone*, with some little mark in the place of the *Division*, as *Pyrrhus* had. Some *Creatures* have over-long, or out-growing *Teeth*, which we call *Fangs* or *Tusks*; as *Boars*, *Pikes*, *Salmons*, and *Dogs*, though less. Some *Living Creatures* have *Teeth* against *Teeth*, as *Men* and *Horses*; and some have *Teeth*, especially their *Master-teeth*, indented one within another like *Saws*, as *Lions*; and so again have *Dogs*. Some *Fishes* have divers *Rows* of *Teeth* in the *Roofs* of their *Mouths*; as *Pikes*, *Salmons*, *Trouts*, &c. and many more in *Salt-waters*. *Snakes* and other *Serpents* have *venomous Teeth*, which are sometimes mistaken for their *Sting*.

753. No *Beast* that hath *Horns* hath *upper-teeth*; and no *Beast* that hath *Teeth* above, wanteth them below. But yet if they be of the same kind, it followeth not, that if the *hard matter* goeth not into *upper-teeth*, it will go into *Horns*; nor yet *e converso*, for *Does* that have no *Horns*, have no *upper-teeth*.

754. *Horses* have, at three years old, a *Tooth* put forth which they call the *Colts-tooth*, and at four years old, there cometh the *Mark-tooth*, which hath a *hole* as big as you may lay a *Pease* within it; and that weareth shorter and shorter every year, till that at eight years old the *Tooth* is smooth, and the *hole* gone; and then they say, That the *Mark* is out of the *Horses Mouth*.

755. The *Teeth* of *Men* breed first; when the *Child* is about a year and half old, and then they cast them, and new come about seven years old. But divers have *Backward teeth* come forth at twenty, yea, some at thirty, and forty. *Quere* of the manner of the coming of them forth. They tell a tale of the old *Countess* of *Desmond*, who lived till she was *Sevenscore* years old, that she did *Dentire* twice or thrice, casting her old *Teeth*, and others coming in their place.

756. *Teeth* are much hurt by *Sweet-meats*, and by *Painting* with *Mercury*, and by *things over hot*, and by *things over-cold*, and by *Rheums*. And the pain of the *Teeth*, is one of the sharpest of pains.

757. Concerning *Teeth*, these things are to be considered. 1. The preserving of them. 2. The keeping of them white. 3. The drawing of them with least pain. 4. The staying and easing of the *Tooth-ach*. 5. The binding in of *Artificial Teeth*, where *Teeth* have been stricken out. 6. And last of all, that great one, of restoring *Teeth* in *Age*. The instances that give any likelihood of restoring *Teeth* in *Age*, are, The late coming of *Teeth* in some, and the renewing of the *Beaks* in *Birds*, which are commaterial with *Teeth*. *Quere* therefore more particularly how that cometh. And again, the renewing of *Horns*. But yet that hath not been known to have been provoked by *Art*; therefore let *tryal* be made, whether *Horns* may be procured to grow in *Beasts* that are not horned, and how; and whether they may be procured to come larger than usual; as to make an *Ox* or a *Deer* have

have a greater Head of Horns; and whether the Head of a Deer, that by age is more spitted, may be brought again to be more branched. For these tryals and the like will shew, Whether by art such hard-matter can be called and provoked. It may be tryed also, whether Birds may not have something done to them when they are young, whereby they may be made to have greater or longer Bills, or greater and longer Talons: And whether Children may not have some Wash, or something to make their Teeth better and stronger. Coral is in use as an help to the Teeth of Children.

SOME Living Creatures generate but at certain seasons of the year; as Deer, Sheep, Wilde Coneyes, &c. and most sorts of Birds and Fishes: Others at any time of the year, as Men, and all Domestick Creatures, as Horses, Hogs, Dogs, Cats, &c. The cause of Generation at all seasons, seemeth to be Fulness; for Generation is from Redundance. This Fulness ariseth from two causes; Either from the Nature of the Creature, if it be Hot, and Moist, and Sanguine; or from Plenty of Food. For the first Men, Horses, Dogs, &c. which breed at all seasons, are full of Heat and Moisture; Doves are the fullest of Heat and Moisture amongst Birds, and therefore breed often, the Tame Dove almost continually. But Deer are a Melancholy dry Creature, as appeareth by their fearfulness, and the hardness of the Flesh. Sheep are a cold Creature, as appeareth by their mildness, and for that they seldom drink. Most sorts of Birds are of a dry substance in comparison of Beasts; Fishes are cold. For the second cause, Fulness of Food; Men, Kine, Swine, Dogs, &c. feed full. And we see, that those Creatures, which, being Wilde, generate seldom, being tame, generate often; which is from warmth and fulness of food. We find that the time of going to Rut of Deer is in September, for that they need the whole Summers Feed, and Grass to make them fit for Generation, and if Rain come early about the middle of September they go to Rut somewhat the sooner; if Drought, somewhat the later. So Sheep, in respect of their small heat, generate about the same time, or somewhat before. But for the most part, Creatures, that generate at certain seasons, generate in the Spring; as Birds and Fishes: For that the end of the Winter, and the heat and comfort of the Spring prepareth them. There is also another reason why some Creatures generate at certain seasons: and that is, the Relation of their time of Bearing to the time of Generation; for no Creature goeth to generate whilst the Female is full, nor whilst she is busie in sitting, or rearing her young; and therefore it is found by experience, that if you take the Eggs or Youngones out of the Nests of Birds, they will fall to generate again three or four times one after another.

Of Living Creatures, some are longer time in the VVomb, and some shorter. Women go commonly nine Moneths, the Cow and the Ewe about six Moneths, Does go about nine Moneths, Mares eleven Moneths, Bitches nine Weeks; Elephants are said to go two years, for the received Tradition of ten years is fabulous. For Birds there is double enquiry; the distance between the treading or coupling, and the laying of the Egg; and again, between the Egg laid, and the disclosing or hatching. And amongst Birds there is less diversity of time then amongst other Creatures, yet some there is; for the Hen sitteth but three weeks, the Turkie-Hen, Goose and Duck, a moneth. Quere of others. The cause of the great difference of times amongst Living Creatures is, either from the nature of the Kind,

758.

Experiments
in Confort,
touching the
Generation
and Bearing
of Living
Creatures in
the Womb.

759.

or from the constitution of the *Womb*. For the former, those that are longer in coming to their maturity or growth, are longer in the *Womb*, as is chiefly seen in *Men*; and for *Elephants*, which are long in the *Womb*, are long time in coming to their full growth. But in most other Kinds, the constitution of the *Womb* (that is, the hardness or dryness thereof) is concurrent with the former cause. For the *Colt* hath about four years of growth and so the *Fawn*, and so the *Calf*; but *Whelps*, which come to their growth (commonly) within three quarters of an year, are but nine weeks in the *Womb*. As for *Birds*, as there is less diversity amongst them in the time of their bringing forth, so there is less diversity in the time of their growth, most of them coming to their growth within a twelve-month.

760. Some Creatures bring forth many young ones at a Burthen; as *Bitches*, *Hares*, *Coneys*; &c. Some (ordinarily) but one; as *Women*, *Lionesses*, &c. This may be caused, either by the Quantity of *Sperm* required to the producing one of that Kind; which if less be required, may admit greater number; if more fewer: Or by the Partitions and Cells of the *Womb*, which may sever the *Sperm*.

761.
Experiments
in Consort,
touching
Species visible.

There is no doubt but *Light* by *Refraction* will shew greater, as well as things coloured; for like as a *shilling* in the bottom of the *Water* will shew greater, so will a *Candle* in a *Lantern* in the bottom of the *Water*. I have heard of a practice, that *Glowworms* in *Glasses* were put in the *Water* to make the *Fish* come. But I am not yet informed, whether when a *Diver* diveth, having his eyes open, and swimmeth upon his back, whether (I say) he seeth things in the *Air*, greater or less. For it is manifest, that when the eye standeth in the finer Medium, and the object is in the grosser, things shew greater; but contrariwise, when the eye is placed in the grosser Medium, and the object in the finer, how it worketh I know not.

762.

It would be well boulded out, whether great *Refractions* may not be made upon *Reflections*, as well as upon direct beams. For example, we see, that take an empty *Basin*, put an *Angel* of *Gold*, or what you will into it; then go so far from the *Basin* till you cannot see the *Angel*, because it is not in a right Line; then fill the *Basin* with *Water*, and you shall see it out of his place, because of the *Reflection*. To proceed therefore, put a *Looking-Glass* into a *Basin* of *Water*; I suppose you shall not see the *Image* in a right Line, or at equal Angles, but aside. I know not whether this Experiment may not be extended so, as you might see the *Image*, and not the *Glass* which for beauty and strangeness, were a fine proof, for then you shall see the *Image* like a *Spirit* in the *Air*. As for example, if there be a *Cistern* or *Pool* of *Water* you shall place over against it a picture of the *Devil*, or what you will. so as you do not see the *Water*, then put a *Looking-Glass* in the *Water*: Now if you can see the *Devils* picture aside, not seeing the *Water*, it will look like a *Devil* indeed. They have an old tale in *Oxford*, That *Fryar Bacon* walked between two *Steeple*s; which was thought to be done by *Glasses*, when he walked upon the *Ground*.

763.
Experiments
in Consort,
touching the
Impulsion and
Percussion.

A Weighty Body put into motion, is more easily impelled then at first when it resteth. The cause is, partly because Motion doth discuss the compactness of solid Bodies, which beside their Motion of Gravity, have in them a Natural Appetite not to move at all; and partly, because a Body that resteth doth get, by the resistance of the Body upon which it resteth, a stronger compression

compression of parts than it hath of it self, and therefore needeth more force to be put in *motion*. For if a *weighty Body* be penfile, and hang but by a *thread*, the *percussion* will make an *impulsion* very near, as easily as if it were already in *motion*.

A *Body over-great*, or *over-small*, will not be thrown so far as a *Body* of a *middle size*; so that (it seemeth) there must be a *commensuration* or *proportion* between the *Body moved*, and the *force*, to make it move well. The *cause* is, because to the *Impulsion* there is requisite the *force* of the *Body* that *moveth*, and the *resistance* of the *Body* that is *moved*; and if the *Body* be *too great*, it yieldeth too little; and if it be *too small*, it resisteth too little.

It is *common experience*, that no *weight* will press or cut so strong, being laid upon a *Body*, as falling or stricken from above. It may be the *Air* hath some part in furthering the *percussion*: But the chief *cause* I take to be, for that the *parts* of the *Body moved*, have by *impulsion*, or by the *motion* of *gravity continued*, a *compression* in them as well downwards, as they have when they are thrown or shot through the *Air* forwards. I conceive also, that the quick *loose* of that *motion* preventeth the *resistance* of the *Body* below; and *priority* of the *force* (always) is of great *efficacy*, as appeareth in *infinite instances*.

Tickling is most in the *Soles* of the *Feet*, and under the *Arm-holes*, and on the *Sides*. The *cause* is, the *thinness* of the *Skin* in those *parts*, joyned with the *rareness* of being touched there; for all *Tickling* is a light *motion* of the *Spirits*, which the *thinness* of the *Skin*, and *suddenness*, and *rareness* of *touch* do further: For we see a *Feather* or a *Rush* drawn along the *Lip* or *Cheek*, doth tickle; whereas a *thing* more *obtnse*, or a *touch* more *hard*, doth not. And for *suddenness*, we see no *man* can tickle himself: We see also, that the *Palm* of the *Hand*, though it hath as *thin* a *Skin* as the other *parts* mentioned, yet is not ticklish, because it is accustomed to be touched. *Tickling* also causeth *Laughter*. The *cause* may be the *emission* of the *Spirits*, and so of the *Breath* by a *flight* from *Titillation*; for upon *Tickling*, we see there is ever a *starting* or *shrinking* away of the part to avoid it; and we see also, that if you tickle the *Nostrils* with a *Feather* or *Straw*, it procureth *Sneezing*, which is a *sudden emission* of the *Spirits*, that do likewise expel the *moisture*. And *Tickling* is ever painful, and not well endured.

It is strange, that the *River* of *Nilus* overflowing, as it doth the *Countrey* of *Egypt*, there should be nevertheless little or no *Rain* in that *Countrey*. The *cause* must be, either in the *Nature* of the *Water*, or in the *Nature* of the *Air*, or of both. In the *Water*, it may be ascribed either unto the *long race* of the *Water*; for *swift-running Waters* vapor not so much as *standing Waters*, or else to the *concoction* of the *Water*; for *WWaters* well *concocted*, vapor not so much as *Waters raw*, no more than *WWaters* upon the *fire* do vapor so much, after some time of *boyling*, as at the first. And it is true, that the *WWater* of *Nilus* is sweeter than other *WWaters* in taste, and it is excellent good for the *Stone*, and *Hypochondriacal Melancholy*, which sheweth it is *lenifying*, and it runneth through a *Countrey* of a *hot Climate*, and flat, without shade either of *WWoods* or *Hills*, whereby the *Sun* must needs have great power to *concoct* it. As for the *Air* (from whence I conceive this want of *Showers* cometh chiefly) the *cause* must be,

764.

765.

766.

Experiment
Solitary,
touching
Titillation.

767.

Experiment
Solitary
touching the
Scarcity of
Rain in
Egypt.

for that the *Air* is of it self *thin* and *thirsty*, and as soon as ever it getteth any *moisture* from the *Water*, it imbibeth, and dissipateth it in the whole Body of the *Air*, and suffereth it not to remain in *Vapor*, whereby it might breed *Rain*.

768.

Experiment
Solitary,
touching
Clarification.

IT hath been touched in the *Title of percolations*, (namely, such as are *inwards*) that the *Whites* of *Eggs* and *Milk* do clarify; and it is certain, that in *Egypt* they prepare and clarify the *Water* of *Nile*, by putting it into great *Jars* of *Stone*, & stirring it about with a few stamped *Almonds*, where-with they also besmear the Mouth of the *Vessel*; and so draw it off, after it hath rested some time. It were good to try this *Clarifying* with *Almonds* in *new Beer*, or *Must*, to hasten and perfect the *Clarifying*.

769.

Experiment
Solitary,
touching
Plants without
Leaves.

There be scarce to be found any *Vegetables* that have *Branches* and no *Leaves*, except you allow *Coral* for one. But there is also in the *Desarts* of *S. Macario* in *Egypt*, a *Plant* which is long, *Leafless*, brown of colour, and branched like *Coral*, save that it closeth at the *top*. This being set in *Water* within the *House*, spreadeth and displayeth strangely; and the people there about have a superstitious belief, that in the *Labor* of *Women* it helpeth to the easie *Deliverance*.

770.

Experiment
Solitary,
touching the
Materials of
Glass.

THE *Crystalline Venice Glass* is reported to be a mixture, in equal portions, of *Stones* brought from *Pavia*, by the River *Ticinum*, and the *Ashes* of a *Weed* called by the *Arabs*, *Kall*, which is gathered in a *Desart* between *Alexandria* and *Rosetta*; and is by the *Egyptians* used first for *Fuel*, and then they crush the *Ashes* into lumps like a *Stone*, and so sell them to the *Venetians* for their *Glass-works*.

771.

Experiments
Solitary,
touching
Prohibition of
Putrefaction,
and the long
Conservation of
Bodies.

IT is strange, and well to be noted, how long *Carcasses* have continued *uncorrupt*, and in their former *Dimensions*, as appeareth in the *Mummies* of *Egypt*, having lasted, as is conceived (some of them) three thousand years. It is true, they find means to draw forth the *Brains*, and to take forth the *Entrails*, which are the *parts* aptest to corrupt. But that is nothing to the wonder; for we see what a soft and corruptible substance the *Flesh* of all the other *parts* of the *Body* is. But it should seem, that according to our *observation* and *axiom*, in our hundredth *Experiment*. *Putrefaction*, which we conceive to be so natural a *Period* of *Bodies*, is but an *accident*, and that *Matter* maketh not that haste to *Corruption* that is conceived, and therefore *Bodies* in *shining Amber*, in *Quick-silver*, in *Balms*, (whereof we now speak) in *Wax*, in *Honey*, in *Gums*, and (it may be) in *Conservatories* of *Snow*, &c. are preserved very long. It need not go for repetition, if we resume again that which we said in the afore-said *Experiment* concerning *Annihilation*: namely, That if you provide against three causes of *Putrefaction*, *Bodies* will not corrupt. The first is that the *Air* be excluded; for that undermineth the *Body*, and conspireth with the *spirit* of the *Body* to dissolve it. The second is, that the *Body* adjacent and ambient be not *Commateral*, but meerly *Heterogeneous* towards the *Body* that is to be preserved; for if nothing can be received by the one, nothing can issue from the other; such are *Quick-silver* and *White Amber* to *Herbs* and *Flies*, and such *Bodies*. The third is, that the *Body* to be preserved, be not of that *gross*, that it may corrupt within it self, although no part of it issue into the *Body* adjacent, and therefore it must be rather *thin* and

and small than of Bulk. There is a fourth Remedy also; which is, That if the Body to be preserved, be of bulk, as a Corps is; then the Body that incloseth it must have a virtue to draw forth and dry the moisture of the inward Body; for else the Putrefaction will play within, though nothing issue forth. I remember Livy doth relate, that there were found at a time two Coffins of Lead in a Tomb, whereof the one contained the Body of King Numa, it being some Four hundred years after his death; and the other, his Books of Sacred Rites and Ceremonies, and the Discipline of the Pontiffs: And that in the Coffin that had the Body, there was nothing (at all) to be seen but a little light Cinders about the sides; but in the Coffin that had the Books, they were found as fresh as if they had been but newly written being written in Parchment, and covered over with Watch-candles of Wax three or four fold. By this it seemeth, that the Romans in Numa's time were not so good Embalmers as the Egyptians were; which was the cause that the Body was utterly consumed. But I find in Plutarch and others, that when Augustus Caesar visited the Sepulchre of Alexander the Great in Alexandria, he found the Body to keep his Dimension; but withal, that notwithstanding all the Embalming (which no doubt was of the best) the Body was so tender, as Caesar touching but the Nose of it, defaced it. Which maketh me find it very strange, that the Egyptian Mummies should be reported to be as hard as Stone-pitch: For I find no difference but one, which indeed may be very material; namely, that the ancient Egyptian Mummies were shrowded in a number of folds of Linnen, besmeared with Gums, in manner of Scar-cloth; which it doth not appear, was practised upon the Body of Alexander.

Near the Castle of Catie, and by the Wells of Assan, in the Land of Idumaea, a great part of the way, you would think the Sea were near hand, though it be a good distance off: And it is nothing, but the shining of the Nitre upon the Sea sand; such abundance of Nitre the Shores there do put forth.

The Dead-Sea, which vomiteth up Bitumen, is of that Crassitude, as Living Bodies, bound hand and foot, and cast into it, have been born up and not sunk: Which sheweth, that all sinking into Water, is but an overweight of the Body put into the Water, in respect of the Water; so that you may make Water so strong and heavy of Quick-silver, (perhaps) or the like, as may bear up Iron; of which I see no use, but Imposture. We see also, that all Metals, except Gold, for the same reason swim upon Quick-silver.

It is reported, that at the Foot of a Hill near the Mare mortuum, there is a Black Stone (whereof Pilgrims make Fires) which burneth like a Coal and diminisheth not, but only waxeth brighter and whiter. That it should do so, is not strange; for we see Iron red hot burneth and consumeth not. But the strangeness is, that it should continue any time so; for Iron, as soon as it is out of the Fire, deadeth straight-ways. Certainly, it were a thing of great use and profit, if you could find out Fuel that would burn hot, and yet last long: Neither am I altogether incredulous, but there may be such Candles as (they say) are made of Salamanders Wool, being a kind of Mineral which whiteneth also in the burning, and consumeth not. The Question is this, Flame must be made of somewhat, and commonly it

772.
Experiment
Solitary,
touching the
Abundance of
Nitre in cer-
tain Sea-
shores.

773.
Experiment
Solitary,
touching
Bodies that are
born up by
Water.

774.
Experiment
Solitary,
touching
Fuel that con-
sumeth little or
nothing.

is made of some *tangible Body* which hath *weight*; but it is not impossible, perhaps, that it should be made of *Spirit* or *Vapor* in a *Body*, (which *Spirit* or *Vapor* hath no *weight*) such as is the matter of *Ignis fatuus*. But then you will say, that that *Vapor* also can last but a short time. To that it may be answered, That by the help of *Oyl* and *Wax*, and other *Candle-stuff*, the flame may continue, and the *wick* not burn.

775.
Experiment
Solitary,
Oeconomical
touching cheap
Fuel.

Sea-coal last longer than *Char-coal*; and *Char-coal* of *Roots*, being coaled into great pieces, last longer than ordinary *Char-coal*. *Turf*, and *Peat*, and *Cow-sheards* are cheap *Fewels*, and last long. *Small-coal* or *Briar-coal* poured upon *Char coal* make them last longer. *Sedge* is a cheap *Fewel* to brew or Bake with, the rather, because it is good for nothing else. Tryal would be made of some mixture of *Sea-coal* with *Earth*, or *Chalk*; for if that mixture be, as the *Sea-coal-men* use it privily, to make the Bulk of the *Coal* greater, it is deceit; but if it be used purposely, and be made known, it is saving.

776.
Experiment
Solitary,
touching the
Gathering of
Wind for
Freshness.

It is at this day in use in *Gaza*, to couch *Pot-herbs* or *Vessels* of *Earth* in their *Walls*, to gather the *Wind* from the top, and to pass it down in Spouts into *Rooms*. It is a device for *freshness* in great Heats. And it is said, there are some *Rooms* in *Italy* and *Spain* for *freshness*, and gathering the *Winds* and *Air* in the Heats of *Summer*; but they be but *Pennings* of the *Winds*, and enlarging them again, and making them *reverberate*, and go round in *Circles*, rather than this device of Spouts in the *Wall*.

777.
Experiment
Solitary,
touching the
Tryals of Airs.

There would be used much diligence in the choice of some *Bodies* and *Places* (as it were) for the *tasting* of *Air*, to discover the *wholsomeness* or *unwholsomeness*, as well of *Seasons*, as of the *Seats* of *Dwellings*. It is certain, that there be some *Houses* wherein *Constitures* and *Pies*, will gather *Mould* more than in others; and I am perswaded, that a *piece* of *raw Flesh* or *Fish*, will sooner corrupt in some *Airs* than in others. They be noble *Experiments* that can make this *discovery*; for they serve for a *Natural Divination* of *Seasons*, better than the *Astronomers* can by their *Figures*, and again, they teach *men* where to chuse their *dwelling* for their better *health*.

778.
Experiment
Solitary,
touching
Encreasing of
Milk in
Milk Beasts.

There is a kind of *Stone* about *Bethlehem* which they grind to powder, and put into *Water*, whereof *Cattel* drink, which maketh them give more *Milk*. Surely, there would be some better Tryals made of *Mixtures* of *Water* in *Ponds* for *Cattel*, to make them more *Milch*, or to *fatten* them, or to keep them from *Murrain*. It may be, *Chalk* and *Nitre* are of the best.

779.
Experiment
Solitary,
touching
Sand of the
Nature of
Glass.

It is reported, that in the *Valley* near the *Mountain Carmel* in *Judea*, there is a *Sand*, which of all other, hath most affinity with *Glass*, inso-much, as other *Minerals* laid in it, turn to a glossie substance without the fire; and again, *Glass* put into it, turneth into the *Mother-sand*. The thing is very strange, if it be true; and it is likeliest to be caused by some *natural Furnace* of *Heat* in the *Earth*, and yet they do not speak of any *Eruption* of *Flames*. It were good to try in *Glass-works*, whether the *crude-Materials* of *Glass* mingled with *Glass*, already made and re-moulten, do not facilitate the making of *Glass*, with less heat.

IN the Sea upon the South-West of Sicily, much Coral is found. It is a Submarine Plant, it hath no leaves, it brancheth onely when it is under Water; it is soft, and Green of Colour; but being brought into the Air, it becometh hard, and shining red, as we see. It is said also to have a white Berry, but we find it not brought over with the Coral: Belike it is cast away as nothing worth. Inquire better of it, for the discovery of the Nature of the Plant.

THe Manna of Calabria is the best, and in most plenty. They gather it from the Leaf of the Mulberry-tree; but not of such Mulberry-trees as grow in the Valleys: and Manna falleth upon the Leaves by night, as other Dews do. It should seem, that before those Dews come upon Trees in the Valleys, they dissipate and cannot hold out. It should seem also, the Mulberry-leaf, it self hath coagulating virtue, which inspissateth the Dew, for that it is not found upon other Trees: And we see by the Silk-worm, which feedeth upon that Leaf, what a dainty smooth Juice it hath; and the Leaves also (especially of the Black Mulberry) are somewhat bristly, which may help to preserve the Dew. Certainly, it were not amiss to observe a little better the Dews that fall upon Trees or Herbs growing on Mountains; for it may be, many Dews fall that spend before they come to the Valleys. And I suppose, that he that would gather the best May Dew for Medicine, should gather it from the Hills.

IT is said, they have a manner to prepare their Greek Wines, to keep them from Fuming and Inebriating, by adding some Sulphur or Allome: whereof the one is Unctuous, and the other is Astringent. And certain it is, that those two Natures do best repress Fumes. This Experiment would be transferred unto other Wine and Strong-Beer, by putting in some like Substances while they work: which may make them both to Fume less, and to inflame less.

IT is conceived by some, (not improbably) that the reason why Wild-fires (whereof the principal ingredient is Bitumen) do not quench with Water, is, for that the first concretion of Bitumen, is a mixture of a fiery and watry substance: so it is not Sulphur. This appeareth, for that in the place near Puteoli, which they call the Court of Vulcan, you shall hear under the Earth a horrible thundring of Fire and Water conflicting together; and there break forth also Sprouts of boiling Water. Now that Place yieldeth great Quantities of Bitumen: whereas Aetna, and Vesuvius, and the like, which consist upon Sulphur, shoot forth Smoak, and Ashes, and Pumice, but no Water. It is reported also, that Bitumen mingled with Lime, and put under Water, will make, as it were, an artificial Rock, the substance becometh so hard.

THere is a Cement compounded of Flower, Whites of Eggs, and Stone powdered, that becometh hard as Marble, wherewith Piscina Mirabilis near Cumæ, is said to have the Walls plaistered. And it is certain, and tried, that the Powder of Load-stone and Flint, by the addition of Whites of Eggs and Gum-dragon, made into Paste, will in a few days harden to the hardness of a Stone.

780.

Experiment Solitary, touching the Growth of Coral.

781.

Experiment Solitary, touching the Gathering of Manna.

782.

Experiment Solitary, touching the Correcting of Wine.

783.

Experiment Solitary, touching Materials of Wild-fire.

784.

Experiment Solitary, touching Plaister growing as hard as Marble.

It

785.
Experiment
Solitary,
touching
Judgement of
the Cure in
some Ulcers
and Hurts.

IT hath been noted by the *Ancients*, that in *full* or *impure* Bodies, *Ulcers* or *hurts* in the *Legs* are hard to cure, and in the *Head* more easie. The *cause* is, for that *Ulcers* or *Hurts* in the *Legs* require *Desiccation*, which by the *deflection* of *Humors* to the *lower parts*, is hindered, whereas *Hurts* and *Ulcers* in the *Head* require it not; but, contrariwise, *Dryness* maketh them more apt to *Consolidate*. And in *Modern* observation, the like difference hath been found between *French-men* and *Englishmen*; whereof the ones *Constitution* is more *dry*, and the others more *moist*: And therefore a *Hurt* of the *Head* is harder to cure in a *French-man*, and of the *Leg* in an *English-man*.

786.
Experiment
Solitary,
touching the
Healthfulness
or Unhealth-
fulness of the
Southern
Wind.

IT hath been noted by the *Ancients*, that *Southern-VVinds* blowing much without *Rain*, do cause a *Fevorous disposition* of the *Year*; but with *Rain*, not. The *cause* is, for that *Southern-VVinds* do of themselves qualifie the *Air* to be apt to cause *Fevers*; but when *Showers* are joyned, they do refrigerate in part, and check the *soultry Heat* of the *Southern-VVind*. Therefore this holdeth not in the *Sea-coasts*, because the *vapor* of the *Sea* without *showers* do refresh.

787.
Experiment
Solitary,
touching
Wounds.

IT hath been noted by the *Ancients*, that *VVounds* which are made with *Brass*, heal more easily then *Wounds* made with *Iron*. The *cause* is, for that *Brass* hath in it self a *Sanative virtue*, and so in the very instant helpeth somewhat; but *Iron* is *Corrosive*, and not *Sanative*. And therefore it were good that the *Instruments* which are used by *Chirurgions* about *Wounds* were rather of *Brass* then *Iron*.

788.
Experiment
Solitary,
touching
Mortification
by Cold.

IN the *cold Countries*, when *Mens Noses* and *Ears* are mortified, and (as it were) *Gangrened* with *cold*, if they come to a *Fire*, they rot off presently. The *cause* is, for that the few *Spirits* that remain in those *parts* are suddenly drawn forth, and so *Putrefaction* is made compleat. But *Snow* put upon them helpeth, for that it preserveth those *Spirits* that remain till they can revive; and besides, *Snow* hath in it a secret *warmth*; as the *Monk* proved out of the *Text*, *Qui dat Nivem sicut Lanam, Gelu sicut Cineres spargit*; whereby he did infer, that *Snow* did warm like *Wool*, and *Frost* did fret like *Ashes*. *Warm Water* also doth good, because by little and little it openeth the pores, without any sudden working upon the *Spirits*. This *Experiment* may be transferred unto the *cure* of *Gangrenes*, either coming of themselves, or induced by too much applying of *Opiates*; wherein you must beware of *dry heat*, and resort to things that are *Refrigerant*, with an inward *warmth* and *virtue* of *Cherishing*.

789.
Experiment
Solitary,
touching
Weight.

WEigh *Iron* and *Aqua fortis* severally, then dissolve the *Iron* in the *Aqua fortis*, and weigh the *Dissolution*; and you shall find it to bear as good weight as the *Bodies* did severally, notwithstanding a good deal of waste by a thick *vapor* that issueth during the *working*; which sheweth, that the *opening* of a *Body* doth increase the *weight*. This was tryed once or twice, but I know not whether there were any *Error* in the *tryal*.

790.
Experiments
Solitary,
touching the
Super-Natation
of Bodies.

TAKE of *Aqua fortis* two Ounces, of *Quick-silver* two Drachms, (for that charge the *Aqua fortis* will bear) the *Dissolution* will not bear a *Flint* as big as a *Nutmeg*; yet (no doubt) the increasing of the *weight* of *Water*

Water will increase his power of bearing; as we see *Broyn*, when it is salt enough, will bear an *Egg*. And I remember well a *Physitian*, that used to give some *Mineral Baths* for the *Gout*, &c. And the *Body* when it was put into the Bath, could not get down so easily as in ordinary *Water*. But it seemeth, the weight of the *Quick silver*, more than the weight of a *Stone*; doth not compense the weight of a *Stone*, more than the weight of the *Aqua-fortis*.

Let there be a *Body* of unequal weight, (as of *Wood* and *Lead*, or *Bone* and *Lead*;) if you throw it from you with the *light end* forward, it will turn, and the *weightier end* will recover to be forwards, unless the *Body* be over long. The cause is, for that the more *Dense Body* hath a more violent pressure of the parts from the first *impulsion*; which is the cause (though heretofore not found out, as hath been often said) of all *Violent Motions*: And when the *hinder part* moveth swifter (for that it less endureth pressure of parts) than the *forward part* can make way for it, it must needs be that the *Body* turn over; for (turned) it can more easily draw forward the *lighter part*. *Galileus* noteth it well, That if an *open Trough*, wherein *Water* is, be driven faster than the *Water* can follow, the *Water* gathereth upon an heap towards the *hinder end*, where the *motion* began; which he supposeth (holding confidently the *motion* of the *Earth*) to be the cause of the *Ebbing* and *Flowing* of the *Ocean*, because the *Earth* over-runneeth the *Water*. Which *Theory* though it be false, yet the first *Experiment* is true; as for the inequality of the pressure of parts, it appeareth manifestly in this, That if you take a *body* of *Stone* or *Iron*, and another of *Wood*, of the same magnitude and shape, and throw them with equal force, you cannot possibly throw the *Wood* so far as the *Stone* or *Iron*.

It is certain (as it hath been formerly in part touched) that *Water* may be the *Medium* of *Sounds*. If you dash a *Stone* against a *Stone* in the bottom of the *Water*, it maketh a *Sound*; so a long *Pole* struck upon *Gravel*, in the bottom of the *Water*, maketh a *Sound*. Nay, if you should think that the *Sound* cometh up by the *Pole*, and not by the *Water*, you shall find that an *Anchor* let down by a *Rope* maketh a *Sound*; and yet the *Rope* is no solid *Body*, whereby the *Sound* can ascend.

All *objects* of the *Senses* which are very offensive, do cause the *Spirits* to retire, and upon their flight, the parts are (in some degree) destitute, and so there is induced in them a *trepidation* and *horror*. For *Sounds*, we see, that the grating of a *saw*, or any very harsh noise, will set the *Teeth* on edge, and make all the *Body* shiver. For *Tastes*, we see, that in the taking of a *Potion*, or *Pills*, the *Head* and the *Neck* shake. For odious smells, the like effect followeth, which is less perceived, because there is a remedy at hand, by stopping of the *Nose*. But in *Horses* that can use no such help, we see the smell of a *Carrion*, especially of a dead *Horse*, maketh them fly away, and take on almost, as if they were mad. For *Feeling*, if you come out of the *Sun* suddenly into a shade, there followeth a *chillness* or *shivering* in all the *Body*. And even in *Sight*, which hath (in effect) no odious object, coming into sudden darkness, induceth an *offer* to shiver.

There is in the *City* of *Ticinum* in *Italy*, a *Church* that hath *Windows* only from above: it is in Length an hundred Feet, in Breadth twenty Feet, and in Height near fifty, having a *Door* in the midst. It reporteth,

791.

Experiment
Solitary,
touching the
Flying of un-
equal Bodies
in the Air.

792.

Experiment
Solitary,
touching
Water, that it
may be the
Medium of
Sounds.

793.

Experiment
Solitary,
of the Flight
of the *Spirits*
upon odious
Objects.

794.

Experiment
Solitary,
touching the
Super-Reflexi-
on of Echoes.

the voice twelve or thirteen times. If you stand by the close *End-wall* over against the *Door*, the *Eccho* fadeth and dieth by little and little, as the *Eccho* at *Pont-Charenton* doth, and the voice soundeth, as if it came from above the *Door*; and if you stand at the *lower end*, or on either *side* of the *Door*, the *Eccho* holdeth; but if you stand in the *Door*, or in the *midst* just over against the *Door*, not. Note, that all *Ecchoes* sound better against *old Walls* than *new*, because they are more *dry* and *hollow*.

795.
Experiment
Solitary,
touching the
force of Imagi-
nation. Imit-
rating that of
the Sense.

THose effects, which are wrought by the *percussion* of the *sense*, and by *things in Fact*, are produced likewise in some degree by the *Imagination*: Therefore if a man see another eat *sowre* or *acide things*, which set the *Teeth* on edge, this *object* tainteth the *Imagination*; so that he that seeth the *thing* done by another, hath his own *Teeth* also set on edge. So if a man see another turn swiftly and long, or if he look upon *Wheels* that turn, himself waxeth *Turn sick*. So if a man be upon a *high place*, without *Rails*, or good hold, except he be used to it, he is ready to fall; for *imagining* a fall, it putteth his *spirits* into the very *action* of a fall. So many upon the *seeing* of others *Bleed*, or *Strangled*, or *Tortured*, themselves are ready to faint, as if they *bled*, or were in *strife*.

796.
Experiment
Solitary,
touching
Preservation of
Bodies.

TAKE a *stock-Gilliflower*, and tie it gently upon a stick, and put them both into a *steeple-glass* full of *Quick-silver*, so that the *Flower* be covered; then lay a little *weight* upon the top of the *Glass*, that may keep the stick down; and look upon them after four or five days, and you shall find the *Flower* fresh, and the *stalk* harder and less *flexible* than it was. If you compare it with another *Flower*, gathered at the same time, it will be the more manifest. This sheweth, that *Bodies* do preserve excellently in *Quick-silver*; and not preserve only, but by the *coldness* of the *Quick-silver*, *indurate*. For the *freshness* of the *Flower* may be merely *Conservation*, (which is the more to be observed, because the *Quick-silver* presseth the *Flower*) but the *stiffness* of the *Stalk* cannot be without *Induration* from the cold (as it seemeth) of the *Quick-silver*.

797.
Experiment
Solitary,
touching the
Growth or
Multiplying of
Metals.

IT is reporteth by some of the *Ancients*, That in *Cyprus* there is a *kind* of *Iron*, that being cut into *little pieces*, and put into the ground, if it be well *watered*, will encrease into *greater pieces*. This is certain, and known of old, that *Lead* will multiply and encrease; as hath been seen in *old Statues* of *Stone*, which have been put in *Cellars*, the *Feet* of them being bound with *Leaden-bands*; where (after a time) there appeared, that the *Lead* did swell, insomuch, as it hanged upon the *Stone* like *Warts*.

798.
Experiment
Solitary,
touching the
Drowning of
the more Base
Metal, in the
more Precious.

I Call *drowning* of *Metals*, when that the *baser Metal* is so incorporate with the more *rich*, as it can by no means be separated again; which is a *kind* of *Version*, though false; as if *Silver* should be inseparably incorporated with *Gold*, or *Copper* and *Lead* with *Silver*. The *Ancient Electrum* had in it a fifth of *Silver* to the *Gold*, and made a *Compound Metal*, as fit for most uses as *Gold*, and more resplendent, and more qualified in some other properties; but then that was easily separated. This to do privily, or to make the *Compound* pass for the *rich Metal* simple, is an *adulteration* or *counterfeiting*; but if it be done avowedly and without disguising, it may be a great *saving* of the *richer Metal*. I remember to have heard of a man skilful in *Metals*, that a fifteenth part of *Silver* incorporate with

Gold

Gold is the onely *Substance* which hath nothing in it *Volatile*, and yet melteth without much difficulty. The *Melting* sheweth, that it is not jejune or scarce in *Spirit*. So that the *fixing* of it is not want of *Spirit* to fly out, but the *equal spreading* of the *Tangible parts*, and the *close coacervation* of them; whereby they have the less appetite, and no means (at all) to issue forth. It were good therefore to try whether *Glass Re-moulten*, do lose any *weight*; for the *parts* in *Glass* are evenly spread, but they are not so close as in *Gold*; as we see by the easie admission *Light, Heat, and Cold*, and by the *smallness* of the *weight*. There be other *Bodies fixed*, which have little, or no *Spirit*, so as there is nothing to fly out; as we see in the *Stuff*, whereof *Coppels* are made, which they put into *Furnaces*, upon which *Fire* worketh not. So that there are three *causes* of *Fixation*; *Even spreading* both of the *Spirits* and *Tangible parts*; the *Closeness* of the *Tangible parts*; and the *Jejune*ness or *extream comminution* of *Spirits*: Of which three, the two first may be joyned with a *Nature Liquefiable*, the last not.

IT is a profound *Contemplation* in *Nature*, to consider of the *Emptiness* (as we may call it) or *Insatisfaction* of *several Bodies*, and of their *appetite* to take in others. *Air* taketh in *Lights*, and *Sounds*, and *Smells*, and *Vapors*: And it is most manifest, that it doth it with a kind of *Thirst*, as not satisfied with his own former *Consistence*; for else it would never receive them in so suddenly and easily. *Water* and all *Liquors* do hastily receive *dry* and more *Terrestrial Bodies* proportionable; and *dry Bodies*, on the other side, drink in *Waters* and *Liquors*: So that (as it was well said of one of the *Ancients* of *Earthy* and *Watry Substance*,) *one is a Glue to another*. *Parchments*, *Skins*, *Cloth* &c. drink in *Liquors*; though themselves be entire *Bodies*, and not *comminuted*, as *Sand* and *Ashes*, nor apparently porous. *Metals* themselves do receive in readily *Strong-waters*, and *Strong-waters* likewise do readily pierce into *Metals* and *Stones*; and that *Strong-waters* will touch upon *Gold*, that will not touch upon *Silver*, and *è converso*. And *Gold*, which seemeth by the *weight* to be the closest and most solid *Body*, doth greedily drink in *Quick-silver*. And it seemeth, that this *Reception* of other *Bodies* is not violent, for it is (many times) *reciprocal*, and as it were, with consent. Of the *cause* of this, and to what *Axiom* it may be referred, consider attentively; for as for the pretty assertion, that *Matter* is like a *Common Strumpet* that desireth all *Forms*, it is but a *Wondring Motion*. Onely *Flame* doth not content it self to take in any other *Body*; but either to overcome, turn another *Body* in it self, as by victory, or it self to die and go out.

799.
Experiment
Solitary,
touching
Fixation of
Bodies.

800.
Experiment
Solitary,
touching the
Restless Na-
ture of Things
in themselves,
and their De-
sire to Change



NATURAL HISTORY;

Century IX.

IT is certain, That all *Bodies* whatsoever, though they have no *Sense*, yet they have *Perception*: For when one *Body* is applied to another, there is a kind of *Electi- on*, to embrace that which is agreeable, and to exclude or expel that which is ingrate: And whether the *Body* be *alterant* or *altered*, evermore a *Perception* precedeth *Operation*; for else all *Bodies* would be alike one to another. And sometimes this *Perception* in some kind of *Bodies* is far more subtil then the *Sense*; so that the *Sense* is but a dull thing in comparison of it. We see a *Weather glass* will find the least difference of the *Weather* in *Heat* or *Cold*, when Men find it not. And this *Perception* also is sometimes at *distance*, as well as upon the *touch*; as when the *Load-stone* draweth *Iron*, or *Flame* fireth *Naphtha* of *Babylon*, a great distance off. It is therefore a *subject* of a very *Noble Enquiry* to enquire of the more subtil *Perceptions*; for it is another *Key* to open *Nature*, as well as the *Sense*, and sometimes better: And besides, it is a principal *means* of *Natural Divination*; for that, which in these *Perceptions* appeareth early, in the great effects cometh long after. It is true also, that it serveth to *discover* that which is *hid*, as well as to *foretel* that which is to *come*, as it is in many subtil *Trials*: As to try whether *Seeds* be old or new, the *Sense* cannot inform; but if you boil them in *Water*, the new *Seeds* will sprout sooner. And so of *Water*, the *taste* will not discover the best *Water*; but the *speedy consuming* of it, and many other *means*, which we have heretofore set down, will discover it, So in all *Physiognomy*, the *Lineaments* of the *Body* will discover those *Natural Inclinations* of the *Mind*, which *Dissimulation* will conceal, or *Discipline* will suppress. We shall therefore now handle onely those two *Perceptions* which pertain to *Natural Divination* and *Discovery*, leaving the handling of

Experiment
in Consort,
touching
Perception in
*Bodies Insens-
sible*, tending
to *Natural
Divination* or
Subtil Tryals.

Perception in other things to be disposed elsewhere. Now it is true, that *Divination* is attained by other means; as if you know the causes, if you know the *Concomitants*, you may judge of the effect to follow; and the like may be said of *Discovery*. But we tie ourselves here to that *Divination* and *Discovery* chiefly, which is caused by an early or subtil *Perception*.

The aptness or propension of *Air* or *Water* to corrupt or putrefie, (no doubt) is to be found before it break forth into manifest *Effects* of *Diseases*, *Blastings*, or the like. We will therefore set down some *Prognosticks* of *Pestilential* and *unwholsome* years.

801. The *Wind* blowing much from the *South* without *Rain*, and *Worms*, in the *Oak-Apple*, have been spoken of before. Also the plenty of *Frogs*, *Grasshoppers*, *Flies*, and the like *Creatures* bred of *Putrefaction*, doth portend *Pestilential* years.

802. Great and early *Heats* in the *Spring*, (and namely in *May*) without *Winds*, portend the same. And generally so do years with little *Wind* or *Thunder*.

803. Great *Droughts* in *Summer*, lasting till towards the end of *August*, and some gentle *showers* upon them, and then some *dry weather* again, do portend a *Pestilent Summer* the year following: For about the end of *August*, all the *sweetness* of the *Earth* which goeth into *Plants* or *Trees* is exhaled; (and much more if the *August* be dry) so that nothing then can breath forth of the *Earth* but a gross *vapor*, which is apt to corrupt the *Air*; and that *vapor* by the first *showers*, if they be gentle, is released, and cometh forth abundantly. Therefore they that come abroad soon after those *showers* are commonly taken with *sickness*. And in *Africa* no *Body* will stir out of doors after the first *showers*. But if the *showers* come vehemently, then they rather wash and fill the *Earth*, then give it leave to breath forth presently. But if *dry weather* come again, then it fixeth and continueth the *corruption* of the *Air* upon the first *showers* begun, and maketh it of ill influence even to the next *Summer*, except a very *Frosty Winter* discharge it, which seldome succeedeth such *Droughts*.

804. The lesser *Infections* of the *Small Pox*, *Purple Feavers*, *Agues* in the *Summer* precedent, and hovering all *Winter*, do portend a great *Pestilence* in the *Summer* following: For *Putrefaction* doth not rise to its height at once.

805. It were good to lay a piece of raw *Flesh* or *Fish* in the open *Air*; and if it putrefie quickly, it is a sign of a disposition in the *Air* to *Putrefaction*. And because you cannot be informed, whether the *Putrefaction* be quick or late, except you compare this *Experiment* with the like *Experiment* in another year; it were not amiss in the same year, and at the same time, to lay one piece of *Flesh* or *Fish* in the open *Air*; and another of the same kind and bigness within doors: For I judge, that if a general disposition be in the *Air* to putrefie, the *Flesh*, or in *Fish* will sooner putrefie abroad, where the more *Air* hath power, then the *House*, where it hath less, being many ways corrected. And this *Experiment* would be made about the End of *March*; for that season is likeliest to discover what the *Winter* hath done, and what the *Summer* following will do upon the *Air*. And because the *Air* (no doubt) receiveth great tincture and *Infusion* from the *Earth*, it were good to try that exposing of *Flesh*

or *Fish* both upon a *Stake* of *Wood*, some height above the *Earth*, and upon the flat of the *Earth*.

Take *May-Dew*, and see whether it putrefie quickly, or no; for that likewise may disclose the *quality* of the *Air*, and *vapor* of the *Earth*, more or less corrupted.

806.

A *dry March*, and a *dry May*, portend a *wholsom Summer*, if there be a *showring April* between; but otherwise it is a *sign* of a *Pestilential year*.

807.

As the *discovery* of the *disposition* of the *Air* is good for the *Prognosticks* of *wholsom* and *unwholsom* years; so it is of much more use for the *choice* of *places* to dwell in; at the least for *Lodges* and *Retiring-places* for *Health* (for *Mansion-Houses* respect *provisions* as well as *health*) wherein the *Experiments* above-mentioned may serve.

808.

But for the *choice* of *Places* or *Seats*, it is good to make tryal, not only of *aptness* of *Air* to corrupt, but also of the *moisture* and *dryness* of the *Air*, and the *temper* of it in *heat* or *cold*, for that may concern *health* diversly. We see that there be some *Houses* wherein *Sweet meats* will relent, and *Baked Meats* will mould, more than in others; and *Wainscots* will also sweat more, so that they will almost run with *Water*: All which (no doubt) are caused chiefly by the *moistness* of the *Air* in those *Seats*. But because it is better to know it before a *Man* buildeth his *House*, than to find it after, take the *Experiments* following.

809.

Lay *Wool*, or a *Sponge*, or *Bread* in the place you would try, comparing it with some other places, and see whether it doth not moisten, and make the *Wool* or *Sponge* &c. more ponderous than the other: And if it do, you may judge of that place, as situate in a *gross* and *moist Air*.

810.

Because it is certain that in some places, either by the *Nature* of the *Earth*, or by the *situation* of *Woods* and *Hills*, the *Air* is more unequal than in others; and *inequality* of *Air* is ever an enemy to *health*: It were good to take two *Weather-glasses*, matches in all things, and to set them for the same hours of one day in several places where no *shade* is, nor *enclosures*; and to mark, when you set them, how far the *Water* cometh; and to compare them, when you come again, how the *Water* standeth then. And, if you find them unequal, you may be sure, that the place, where the *Water* is lowest, is in the warmer *Air*, and the other in the *Colder*. And the greater the *inequality* be of the *ascent* or *descent* of the *Water*, the greater is the *inequality* of the *temper* of the *Air*.

811.

The *Predictions* likewise of *cold* and *long VVinters*, and *hot* and *dry Summers*, are good to be known, as well for the *discovery* of the *causes*, as for divers *Provisions*. That of *Plenty* of *Haws*, and *Heps*, and *Bryar-Berries*, hath been spoken of before. If *Wainscot* or *Stone*, that have used to sweat, be more dry in the beginning of *Winter*, or the *drops* of the *Eaves* of *Houses* come more slowly down than they use, it portendeth a *hard* and *frosty Winter*. The cause is, for that it sheweth an *inclination* of the *Air* to *dry Weather*, which in *Winter* is ever joyned with *Frost*.

812.

Generally a *moist* and *cool Summer*, portendeth a *hard VVinter*. The cause is, for that the *vapors* of the *Earth* are not dissipated in the *Summer* by the *Sun*; and so they rebound upon the *Winter*.

813.

A *hot* and *dry Summer* and *Autumn*, and especially if the *heat* and *drought* extend far into *September*, portendeth an open beginning of *Winter*, and *colds* to succeed toward the latter part of the *Winter*, and the beginning of the *Spring*. For till then the former *heat* and *drought* bear the sway, and the *vapors* are not sufficiently multiplied.

814.

815. An open and warm *Winter* portendeth a hot and dry Summer: For the *Vapors* disperse into the *Winter showers*; whereas Cold and Frost keepeth them in, and transporteth them into the late Spring and Summer following.
816. Birds that use to change *Countries* at certain Seasons, if they come earlier, do shew the temperature of *Weather*, according to that *Country* whence they came: As the *Winter-Birds*, (namely, *Woodcocks*, *Feldefares*, &c.) if they come earlier, and out of the Northern *Countries*, with us shew cold *Winters*. And if it be in the same *Country*, then they shew a temperature of Season, like unto that Season in which they come; as *Swallows*, *Bats*, *Cuckoos*, &c. that come towards Summer, if they come early, shew a hot Summer to follow.
817. The *Prognosticks* more immediate of *Weather* to follow soon after, are more certain than those of Seasons: The *Resounding* of the Sea upon the Shore, and the *Murmur* of Winds in the Woods, without apparent Wind, shew Wind to follow. For such Winds, breathing chiefly out of the Earth, are not at the first perceived, except they be pent by Water or Wood. And therefore a *Murmur* out of *Caves* likewise portendeth as much.
818. The *Upper Regions* of the Air, perceive the Collection of the matter of Tempest and Winds before the Air here below. And therefore the obscuring of the smaller Stars, is a sign of Tempests following. And of this kind you shall find a number of instances in our *Inquisition de Ventis*.
819. Great Mountains have a Perception of the disposition of the Air to Tempests, sooner than the Valleys or Plains below. And therefore they say in Wales, When certain Hills have their Night-caps on, they mean mischief. The cause is, for that Tempests, which are for the most part bred above in the Middle Region, (as they call it) are soonest perceived to collect in the places next it.
820. The Air and Fire have subtil Perceptions of Wind rising, before Men find it. We see the trembling of a Candle will discover a Wind, that otherwise we do not feel; & the Flexions burning of Flames doth shew the Air beginneth to be unquiet; and so do Coals of fire, by casting off the ashes more than they use. The cause is, for that no Wind at the first, till it hath struck and driven the Air, is apparent to the Sense; but flame is easier to move than Air. And for the Ashes, it is no marvel though Wind unperceived shake them off: for we usually try which way the Wind bloweth, by casting up Grass or Chaff, or such light things into the Air.
821. When Wind expireth from under the Sea, as it causeth some resounding of the Water, (whereof we spake before) so it causeth some light motions of Bubbles, and white Circles of Froth. The cause is, for that the Wind cannot be perceived by the Sense, until there be an Eruption of a great quantity from under the Water, and so it getteth into a Body, whereas in the first putting up, it cometh in little portions.
822. We spake of the Ashes that Coals cast off, and of Grass and Chaff carried by the Wind; so any light thing that moveth, when we find no Wind, sheweth a Wind at hand: As when Feathers or Down of Thistles fly to and fro in the Air.
- For *Prognosticks* of Weather from Living Creatures, it is to be noted, That Creatures that live in the open Air (*sub dio*) must needs have a quicker impression from the Air, than Men that live most within doors; and especially Birds, who live in the Air freest and clearest, and are aptest by their voice to tell tales what they find, and likewise by the motion of their flight to express the same.

Water fowls (as *Sea-Gulls*, *Moor-Hens*, &c.) when they flock and flie together from the *Sea* towards the *Shores*; and contrariwise *Land Birds*, (as *Crows*, *Swallows*, &c.) when they flie from the *Land* to the *Waters*, and beat the *Waters* with their *Wings*, do foreshew *Rain* and *Wind*. The cause is, *Pleasure* that both kinds take in the moistness and density of the *Air*, and so desire to be in *motion*, and upon the *Wing*, whither-soever they would otherwise go: For it is no marvel, that *Water-fowl* do joy most in that *Air*, which is likest *Waters*; and *Land Birds* also (many of them) delight in *Bathing* and moist *Air*. For the same reason also, many *Birds* do prune their *Feathers*, and *Geese* do gaggle, and *Crows* seem to call upon *Rain*. All which is but the comfort they seem to receive in the relenting of the *Air*.

823.

The *Heron* when she soareth high, (so as sometimes she is seen to pass over a *Cloud*) sheweth *Winds*: But *Kites* flying aloft, shew fair and dry weather. The cause may be, for that they both mount most into the *Air* of that temper wherein they delight. And the *Heron*, being a *Water-fowl*, taketh pleasure in the *Air* that is condensed; and besides, being but heavy of *Wing*, needeth the help of the grosser *Air*. But the *Kite* affecteth not so much the grossness of the *Air*, as the cold and freshness thereof; for being a *Bird of Prey*, and therefore hot, she delighteth in the fresh *Air*, and (many times) flieth against the *Wind*; as *Trouts* and *Salmons* swim against the stream. And yet it is true also, that all *Birds* find an ease in the depth of the *Air*, as *Swimmers* do in a deep *Water*. And therefore when they are aloft, they can uphold themselves with their *Wings spread*, scarce moving them.

824.

Fishes, when they play towards the top of the *Water*, do commonly foretel *Rain*. The cause is, for that a *Fish* hating the dry, will not approach the *Air* till it groweth moist; and when it is dry will fly it, and swim lower.

825.

Beasts do take comfort (generally) in a moist *Air*, and it maketh them eat their *Meat* better; and therefore *Sheep* will get up betimes in the morning to feed against *Rain*; and *Cattle*, and *Deer*, and *Coneys* will feed hard before *Rain*, and a *Heifer* will put up his *Nose*, and snuff in the *Air* against *Rain*.

826.

The *Trifoil* against *Rain*, swelleth in the *Stalk*, and so standeth more upright; for by wet, *Stalks* do erect, and *Leaves* bow down. There is a small *Red Flower* in the *Stubble Fields*, which Countrey people call the *Wincopie*; which, if it open in the *Morning*, you may be sure of a fair day to follow.

827.

Even in *Men*, *Aches*, and *Hurts*, and *Corns*, do engrieve either towards *Rain*, or towards *Frost*; for the one maketh the *Humors* more to abound, and the other maketh them sharper. So we see both extremes bring the *Gout*.

828.

Worms, *Vermine*, &c. do foreshew (likewise) *Rain*; for *Earth-worms* will come forth, and *Moles* will cast up more, and *Fleas* bite more against *Rain*.

829.

Solid Bodies likewise foreshew *Rain*: as *Stones* and *Wainscot* when they sweat, and *Boxes* and *Pegs* of *Wood* when they draw and wind hard; though the former be but from an outward cause, for that the *Stone* or *Wainscot* turneth and beateth back the *Air* against it self; but the latter is an inward swelling of the *Body* of the *Wood* it self.

830.

831.
Experiment
Solitary,
touching the
Nature of Ap-
petite in the
Stomach.

Appetite is moved chiefly by things that are cold and dry. The cause is, for that Cold is a kind of indigence of Nature, and calleth upon supply, and so is Dryness: And therefore all sowre things (as Vinegar, Juyce of Lemmons, Oyl of Vitriol, &c.) provoke Appetite. And the Disease which they call *Appetitus Caninus*, consisteth in the Matter of an Acide and Glassy Phlegm in the Mouth of the Stomach. Appetite is also moved by sowre things, for that sowre things induce a contraction in the Nerves, placed in the Mouth of the Stomach, which is a great cause of Appetite. As for the cause why Onions, and salt, and Pepper in Baked Meats move Appetite, it is by Vellication of those Nerves; for Motion whetteth. As for VVormwood, Olives, Capers, and others of that kind, which participate of Bitterness, they move Appetite by Absterision. So as there be four principal causes of Appetite; the Refrigeration of the Stomach joyned with some Dryness, Contraction, Vellication, and Absterision; besides Hunger, which is an emptiness; and yet over-fasting doth (many times) cause the Appetite to cease, for that want of Meat maketh the Stomach draw Humors, and such Humors as are light and Cholerick, which quench Appetite most.

832.
Experiment
Solitary,
touching
Sweetness of
Odor from the
Rainbow.

IT hath been observed by the Ancients, that where a Rainbow seemeth to hang over, or to touch, there breatheth forth a sweet smell. The cause is, for that this happeneth but in certain matters which have in themselves some Sweetness, which the gentle Dew of the Rainbow doth draw forth; and the like do soft Showers, for they also make the Ground sweet: But none are so delicate as the Dew of the Rainbow where it falleth. It may be also, that the Water it self hath some Sweetness; for the Rainbow consisteth of a Glomeration of small drops, which cannot possibly fall but from the Air that is very low, and therefore may hold the very Sweetness of the Herbs and Flowers as a Distilled Water: For Rain and other Dew that fall from high cannot preserve the smell, being dissipated in the drawing up; neither do we know, whether some Water it self may not have some degree of Sweetness. It is true, that we find it sensibly in no Pool, River, nor Fountain; but good Earib newly turned up, hath a freshness and good sent, which Water, if it be not too equal, (for equal objects never move the Sense) may also have. Certain it is, that Bay salt, which is but a kind of Water congealed, will sometimes smell like Violets.

833.
Experiment
Solitary,
touching
Sweet Smells.

TO sweet Smells, heat is requisite to concoct the Matter, and some Moisture to spread the Breath of them: For heat, we see that Woods and Spices are more odorate in the Hot Courtreys, than in the Cold. For Moisture, we see that things too much dried lose their Sweetness, and Flowers growing smell better in a Morning or Evening, than at Noon. Some sweet smells are destroyed by approach to the Fire, as Violets, Wall-flowers, Gilliflowers, Pinks, and generally all Flowers that have cool and delicate Spirits. Some continue both on the fire, and from the fire, as Rose water, &c. Some do scarce come forth, or at least not so pleasantly, as by means of the fire, as Juniper, sweet Gums, &c. and all smells that are enclosed in a fast Body, but (generally) those smells are the most grateful, where the degree of heat is small, or where the strength of the smell is allayed; for these things do rather woo the Sense, than satiate it. And therefore the smell of Violets and Roses exceedeth in sweetness that of Spices; and Gums, and the strongest sort of smells, are best in a weft afar off.

IT is certain, that no *smell* issueth but with *emission* of some *corporeal substance*: not as it is in *Light*, and *Colours*, and in *Sounds*: For we see plainly that *smells* doth spread nothing that distance that the other do. It is true, that some *Woods* of *Oranges*, and *Heaths* of *Rosemary*, will smell a great way into the *Sea*, perhaps twenty Miles; but what is that, since a *peal* of *Ordnance* will do as much, which moveth in a small compass, whereas those *Woods* and *Heaths* are of vast spaces? Besides, we see that *smells* do adhere to *hard Bodies*; as in *perfuming* of *Gloves*, &c. which sheweth them *corporeal*; and do last a great while, which *sounds* and *Light* do not.

THe *Excrements* of most *Creatures* smell ill, chiefly to the same *Creature* that voideth them: For we see, besides that of *Man*, that *Pigeons*, and *Horses* thrive best, if their *Houses* and *Stables* be kept sweet and; so of *Cage-Birds* and the *Cat* burieth that which she voideth. And it holdeth chiefly in those *Beasts* which feed upon *Flesh*. *Dogs* (almost) only of *Beasts* delight in *fetide odors*; which sheweth there is somewhat in their *sense* of *smell* differing from the *smells* of other *Beasts*. But the *cause* why *Excrements* smell ill is manifest, for that the *Body* it self rejecteth them, much more the *Spirits*: and we see, that those *Excrements* that are of the *first digestion* smell the worst, as the *Excrements* from the *Belly*; those that are from the *second digestion* less ill, as *Urine*; and those that are from the *third*, yet less, for *Sweat* is not so bad as the other two, especially of some *persons* that are full of *heat* likewise most *Putrefactions* are of an *odious smell*, for they smell either *fetide* or *mouldy*. The *cause* may be, for that *Putrefaction*, doth bring forth such a *consistence*, as is most contrary to the *consistence* of the *Body*, whilst it is found, for it is a meer *dissolution* of that *form*. Besides, there is another reason, which is profound: And it is, That the *objects* that please any of the *senses* have (all) some *equality*, and (as it were) *order* in their *composition*, but where those are wanting the *object* is ever ingrate. So *mixture* of many *disagreeing colours* is ever unpleasant to the *eye*: *Mixture* of *discordant sounds* is unpleasant to the *Ear*: *Mixture* or *hotch-potch* of many *tastes* is unpleasant to the *taste*; *harshness* and *ruggedness* of *Bodies* is unpleasant to the *touch*. Now it is certain, that all *Putrefaction*, being a *dissolution* of the *first form*, is a meer *confusion*, and *unformed mixture* of the part. Nevertheless it is strange, and seemeth to cross the former *observation*, that some *Putrefactions* and *Excrement* do yield excellent *Odors*: as *Civet* and *Musk*, and, as some think, *Amber-greese*, for divers take it (though unprobable) to come from the *Sperm* of *Fish*; and the *Moss* we spake of from *Apple-trees* is little better than an *Excretion*. The reason may be, for that there passeth in the *Excrements*, and remaineth in the *Putrefactions* some good *spirits*, especially where they proceed from *Creatures* that are very *hot*. But it may be also joyned with a further *cause*, which is more subtil; and it is, that the *Senses* love not to be over pleased, but to have a *commixture*, of somewhat that is in it self ingrate. Certainly, we see how *Discords* in *Musick*, falling upon *Concords*, make the *sweetest strains*: And we see again what strange *tastes* delight the *taste*; as *Red-herrings*, *Caviare*, *Permesan*, &c. And it may be the same holdeth in *smells*. For those kind of *smells* that we have mentioned are all strong, and do pull and vellicate the *Sense*. And we find also, that *places* where men *Urine* commonly have some *smell* of *Violets*. And *Urine* if one hath eaten *Nutmeg* hath so to.

834.
Experiment
Solitary,
touching the
Corporeal
Substance of
Smells.

835.
Experiment
Solitary,
touching
Fetide and
Fragrant O-
dors.

The slothful, general, and indefinite *Contemplations* and *Notions* of the *Elements*, and their *Conjugations* of the *Influences* of *Heaven*, of *Heat*, *Cold*, *Moisture*, *Drought*, *Qualities Active*, *Passive*, and the like, have swallowed up the true *Passages*, and *Processes*, and *Affects*, and *Consistences* of *Matter*, and *Natural Bodies*. Therefore they are to be set aside, being but *notional*, and *ill limited*; and definite *axioms* are to be drawn out of *measured instances*, and so assent to be made to the more *general axioms* by *Scale*. And of these kinds of *Processes* of *Natures*, and *Characters* of *Matter*, we will now set down some *instances*.

836.
Experiment
Solitary,
touching the
Causes of Pu-
trification,

ALL *Putrefactions* come chiefly from the *inward spirits* of the *Body*, and partly also from the *Ambient Body*, be it *Air*, *Liquor*, or whatever else. And this last, by two means; either by *ingress* of the *substance* of the *Ambient Body* into the *Body putrefied*, or by *excitation*, and *solicitation* of the *Body putrefied*, and the *parts* thereof, by the *Body Ambient*. As for the received opinion, that *Putrefaction* is caused either by *Cold*, or *Peregrine* and *Preternatural Heat*, it is but *nugation*: For *Cold* in *things inanimate*, is the greatest enemy that is to *Putrefaction*, though it *extinguisheth Vivification*, which ever consisteth in *Spirits attenuate*, which the *Cold* doth *congeal* and *coagulate*. And as for the *Peregrine Heat*, it is thus far true, That if the *proportion* of the *adventive Heat*, be greatly *predominant* to the *Natural heat*, and *Spirits* of the *Body*, it tendeth to *dissolution*, or *notable alteration*. But this is wrought by *Emission*, or *Suppression*, or *Suffocation* of the *Native Spirits*, and also by the *Disordination* and *Discomposture* of the *Tangible parts*, and other *passages* of *Nature*, and not by a *conflict* of *Heats*.

837.
Experiment
Solitary,
touching
Bodies unper-
fectly mixt.

IN *versions* or main *Alterations* of *Bodies*, there is a *Medium* between the *Body*, as it is at first, and the *Body resulting*; which *Medium* is *Corpus imperfecte Mixtum*, and is *transitory*, and not *durable*; *Mists*, *Smoaks*, *Vapors*, *Chylus* in the *Stomach*, *Living Creatures* in the first *Vivification*; and the *middle action*, which produceth such *Imperfect Bodies*, is fitly called (by some of the *Ancients*) *Inquination* or *inconcoction*, which is a kind of *Putrefaction*; for the *parts* are in *confusion*, till they settle, one way or other.

838.
Experiment
Solitary,
touching
Concoction and
Crudity.

THe word *Concoction* or *Digestion*, is chiefly taken into use from *Living Creatures*, and their *Organs*, and from thence extended to *Liquors* and *Fruits*, &c. Therefore they speak of *Meat concocted*, *Urine* and *Excrements concocted*; and the *Four Digestions* (in the *Stomach*, in the *Liver*, in the *Arteries* and *Nerves*, and in the *several parts* of the *Body*) are likewise called *Concoctions* and they are all made to be the works of *Heat*. All which *notions* are but ignorant catches of a few things, which are most obvious to *Mens observations*. The constantest *notion* of *Concoction* is, that it should signify the *degrees of alteration* of one *Body* into another, from *Crudity* to *Perfect concoction*, which is the *ultimity* of that *action* or *process*. And while the *Body* to be *converted* and *altered*, is too strong for the *efficient*, that should *convert* or *alter* it, (whereby it resisteth, and holdeth fast in some degree the first *Form* or *Consistence*) it is (all that while) *Crude* and *Inconcoct*, and the *Process* is to be called *Crudity* and *Inconcoction*. It is true, that *Concoction* is in great part the *work of Heat*; but not the *work of Heat* alone: For all things that further the *Conversion* or *Alteration* (as *Rest*, *Mixture* of a *Body* already *concocted*, &c.) are also means to *Concoction*. And there

there are of *Concoction* two Periods, the one *Assimilation*, or *absolute Conversion* and *Subaction*; the other *Maturation*: Whereof, the former is most conspicuous in the *Bodies* of *Living Creatures*, in which there is an *Absolute Conversion* and *Assimilation* of the *Nourishment* into the *Body*, and likewise in the *Bodies* of *Plants*; and again in *Metals*, where there is a full *Transmutation*. The other (which is *Maturation*) is seen in *Liquors* and *Fruits*; wherein there is not desired, nor pretended, an utter *Conversion*, but onely an *Alteration* to that *Form*, which is most sought for *Mans* use; as in *Clarifying* of *Drinks*, *Ripening* of *Fruits*, &c. But note, that there be two kinds of *Absolute Conversions*. The one is, when a *Body* is converted into another *Body* which was before; as when *Nourishment* is turned into *Flesh*, that is it which we call *Assimilation*. The other is, when the *Conversion* is into a *Body* meerly new, and which was not before; as if *Silver* should be turned to *Gold*, or *Iron* to *Copper*. And this *Conversion* is better called, for distinction sake, *Transmutation*.

There are also divers other great alterations of *Matter* and *Bodies*, besides those that tend to *Concoction* and *Maturation* for whatsoever doth so alter a *Body*, as it returneth not again to that it was, may be called *Alteratio Major*: As when *Meat* is *Boiled*, or *Roasted*, or *Fried*, &c. Or when *Bread* and *Meat* are *Baked*; or when *Cheese* is made of *Curds*, or *Butter* of *Cream*, or *Coals* of *Wood*, or *Bricks* of *Earth*; and a number of others. But to apply *Notions Philosophical* to *Plebeian Terms*; or to say, where the *Notions* cannot fitly be reconciled, that there wanteth a *Term* or *Nomenclature* for it, (as the *Ancients* used) they be but shifts of *Ignorance*: For *Knowledge* will be ever a *Wandering* and *Indigested thing*, if it be but a *commixture* of a few *Notions* that are at hand, and occur, and not excited from sufficient number of instances, and those well collated.

The *Consistencies* of *Bodies* are very divers: *Dense*, *Rare*, *Tangible*, *Pneumatical*, *Volatile*, *Fixed*, *Determinate*, not *Determinate*; *Hard*, *Soft*, *Cleaving*, not *Cleaving*; *Congevalable*, not *Congevalable*; *Liquefiable*, not *Liquefiable*; *Fragile*, *Tough*, *Flexible*, *Inflexible*; *Tractile*, or to be drawn forth in length, *Intractile*, *Porous*, *Solide*, *Equal* and *Smooth*, *Unequal*, *Venous*, and *Fibrous*, and with *Grains* *Entire*, and divers others. All which to refer to *Heat* and *Cold*, and *Moisture*, and *Drought*, is a *Compendious* and *Inutile speculation*. But of these see principally our *Abecedarium Naturæ*, and otherwise *sparsim* in this our *Silva Silvarum*. Nevertheless, in some good part, we shall handle divers of them now presently.

Liquefiable and not *Liquefiable* proceed from these causes. *Liquefaction* is ever caused by the *Detention* of the *Spirits*, which play within the *Body*, and open it. Therefore such *Bodies* as are more *Turgid* of *Spirit*, or that have their *Spirits* more *straightly imprisoned*, or again, that hold them better *Pleased* and *content*, are *Liquefiable*: For these three *Disposition* of *Bodies* do arrest the *Emission* of the *Spirits*. An example of the first two *Properties* is in *Metals*, and of the last in *Grease*, *Pitch*, *Sulphur*, *Butter*, *Wax*, &c. The *Disposition* not to *Liquefie*, proceedeth from the easie *Emission* of the *Spirits*, whereby the *grosser parts* contract; and therefore *Bodies* jejune of *Spirits*, or which part with their *Spirits* more *willingly*, are not *Liquefiable*; as *Wood*, *Clay*, *Free-stone*, &c. But yet even many of those *Bodies* that will not *Melt*, or will hardly *melt*, will notwithstanding *soften*; as *Iron* in the *Forge*

839.
Experiment
Solitary,
touching
Alterations,
which may be
called Majors.

840.
Experiment
Solitary,
touching
Bodies Liquef-
able, and not
Liquefiable.

Forge, and a *Stick* bathed in hot *Ashes*, which thereby becometh more Flexible. Moreover, there are some *Bodies* which do *Liquefie* or dissolve by *Fire*; as *Metals*, *Wax*, &c. and other *Bodies* which dissolve in *Water*, as *Salt*, *Sugar*, &c. The *cause* of the former proceedeth from the *Dilatation* of the *Spirits* by *Heat*: The *cause* of the latter proceedeth from the *opening* of the *Tangible parts*, which desire to receive the *Liquor*. Again, there are some *Bodies* that dissolve with both; as *Gum*, &c. And those be such *Bodies* as on the one side have good store of *Spirits*, and on the other side have the *Tangible parts* indigent of *Moisture*; for the former helpeth to the *dilating* of the *Spirits* by the *Fire*, and the latter stimulateth the parts to receive the *Liquor*.

841.

Experiment
Solitary,
touching
*Bodies Fragile
and Tough.*

OF *Bodies* some are *Fragile*, and some are *Tough* and not *Fragile*; and on the *breaking*; some *Fragile bodies* break, but where the *force* is, some thatter and fly in many pieces. Of *Fragility*, the *cause* is an *impotency* to be *extended*; and therefore *Stone* is more *Fragile* then *Metal*, and so *Fidile Earth* is more *Fragile* than *Crude Earth*, and *Dry Wood* than *Green*. And the *cause* of this *unaptness* to *Extension*, is the small *quantity* of *Spirits* (for it is the *Spirit* that furthereth the *Extension* or *Dilatation* of *Bodies*;) and it is ever concomitant with *Porosity*, and with *Dryness* in the *Tangible parts*, *Contrariwise*, *Tough Bodies* have more *Spirit*, and fewer *Pores*, and *Moister Tangible parts*: Therefore we see, that *Parchment* or *Leather* will stretch, *Paper* will not; *Woollen-Cloth* will tenter, *Linnen* scarcely.

842.

Experiment
Solitary,
touching
*Two kinds of
Pneumatics
in Bodies.*

ALL *solid Bodies* consist of *Parts* of two several *Natures*; *Pneumatical*, and *Tangible*; and it is well to be noted, that the *Pneumatical Substance* is in some *Bodies*, the *Native Spirit* of the *Body*; and in some other, plain *Air* that is gotten in; as in *Bodies* desiccate, by *Heat* or *Age*: For in them, when the *Native Spirit* goeth forth, and the *Moisture* with it, the *Air* with time getteth into the *Pores*. And those *bodies* are ever the more *Fragile*; for the *Native Spirits* is more *Yielding* and *Extensive* (especially to follow the *Parts*) than *Air*. The *Native Spirits* also admit great diversity; as *Hot*, *Cold*, *Active*, *Dull*, &c. Whence proceed most of the *Vertues*, and *Qualities* (as we call them) of *Bodies*: But the *Air* intermixt, is without *Vertues*, and maketh things *insipid*, and without any *extimulation*.

843.

Experiment
Solitary,
touching
*Concretion and
Dissolution of
Bodies.*

THE *Concretion* of *Bodies* is (commonly) solved by the *contrary*; as *Ice*, which is congealed by *Cold*, is dissolved by *Heat*; *Salt* and *Sugar*, which are excocted by *Heat*, are dissolved by *Cold* and *Moisture*. The *cause* is, for that these *operations* are rather *returns* to their former *Nature*, than *alterations*; so that the *contrary* cureth. As for *Oyl*, it doth neither easily congeal with *Cold*, nor thicken with *Heat*. The *cause* of both effects, though they be produced by *contrary efficients*, seemeth to be the same; and that is, because the *spirit* of the *Oyl*, by either means, exhalet little: For the *Cold* keepeth it in, and the *Heat* (except it be vehement) doth not call it forth. As for *Cold*, though it take hold of the *Tangible parts*, yet as to the *Spirits*, it doth rather make them swell, than congeal them: As when *Ice* is congealed in a *Cup*, the *Ice* will swell instead of contracting, and sometimes rift.

OF Bodies, some (we see) are *hard*, and some *soft*: The *hardness* is caused (chiefly) by the *Jejuneness* of the *Spirits*; and their *imparity* with the *Tangible parts*: Both which, if they be in a greater degree, maketh them not only *hard*, but *fragile*, and less enduring of *pressure*; as *Steel*, *Stone*, *Glass*, *Dry Wood*, &c. *Softness* cometh (contrariwise) by the greater *quantity* of *Spirits*, (which ever helpeth to induce *yielding* and *cession*;) and by the more *equal spreading* of the *Tangible parts*, which thereby are more *sliding*, and *following*; as in *Gold*, *Lead*, *Wax*, &c. But note, that *soft Bodies* (as we use the word) are of two *kinds*; the one, that easily giveth place to another *Body*, but altereth not *Bulk* by rising in other *places*; and therefore we see that *Wax*, if you put any thing into it, doth not rise in *Bulk*, but only giveth place: For you may not think, that in *Printing* of *Wax*, the *Wax* riseth up at all; but only the *depressed part* giveth place, and the other remaineth as it was. The other that altereth *Bulk* in the *Cession*, as *Water*; or other *Liquors*, if you put a *Stone*, or any thing into them, they give place (indeed) easily, but then they rise all over; which is a false *Cession*, for it is in *place*, and not in *Body*.

844.
Experiment
Solitary,
touching
Hard and
Soft Bodies.

ALl Bodies *Ductile*, and *Tensile*, (as *Metals* that will be drawn into *Wires*; *Wool*, and *Tow* that will be drawn into *Tarn* or *Thread*;) have in them the *Appetite* of *Not discontinuing*, strong; which maketh them follow the force that pulleth them out; and yet so, as not to *discontinue* or forsake their own *Body*. *Viscous Bodies* (likewise) as *Pitch*, *Wax*, *Birdlime*, *Cheese* toasted, will draw forth and roap. But the difference between *Bodies fibrous*, and *Bodies viscous*, is plain; For all *Wool*, and *Tow*, and *Cotton*, and *Silk* (especially raw *Silk*) have, besides their desire of *continuance*, in regard of the *tenuity* of their *Thread*, a *greediness* of *Moisture*, and by *Moisture* to joyn and incorporate with other *Thread*, especially, if there be a little *Wreathing*, as appeareth by the *twisting* of *Thread*, and the practice of *Twirling* about of *Spindles*. And we see also, that *Gold* and *Silver Thread* cannot be made without *Twisting*.

845.
Experiment
Solitary,
touching
Bodies ductile
and Tensile.

THe differences of *impressible*, and *not impressible*; *figurable*, and *not figurable*; *mouldable*, and *not mouldable*; *scissile*, and *not scissile*; and many other *Passions* of *Matter*, are *Plebeian Notions*; applied unto the *Instruments* and *Uses* which Men ordinarily practise; but they are all but the effects of some of these causes following, which we will enumerate without applying them, because that would be too long. The first is the *Cession*, or not *Cession* of *Bodies*, into a *smaller space*, or *room*; keeping the outward *Bulk*, and not flying up. The second is, the *stronger* or *weaker Appetite*, in *Bodies*, to *continuity*, and to *file discontinuity*. The third is, the *disposition* of *Bodies* to *contract*, or not *contract*; and again, to *extend*, or not *extend*. The fourth is, the *small quantity*, or *great quantity* of the *Pneumatical* in *Bodies*. The fifth is, the *nature* of the *Pneumatical*, whether it be *Native Spirit* of the *Body*, or *common Air*. The sixth is, the *Nature* of the *Native Spirits* in the *Body*, whether they be *Active*, and *Eager*, or *Dull*, and *Gentle*. The seventh is, the *emission* or *detension* of the *Spirits* in *Bodies*. The eighth is, the *dilatation* or *contraction* of the *Spirits* in *Bodies*, while they are detained. The ninth is, the *collocation* of the *Spirits* in *Bodies*, whether the *collocation* be *equal* or *unequal*; and again, whether the *Spirits* be *coacervate* or *diffused*. The tenth is, the *density* or *rarity* of the *Tangible parts*.

846.
Experiment
Solitary,
touching
Other Passions
of Matter, and
Characters of
Bodies.

the eleventh is the *Equality* or *Inequality* of the *Tangible parts*; the twelfth is the *Digestion* or *Crudity* of the *Tangible parts*; the thirteenth is the *Nature* of the *Matter*, whether *Sulphureous*, or *Mercurial*, *Watry*, or *Oily*, *Dry*, and *Terrestrial*, or *Moist* and *Liquid*; which *Natures* of *Sulphureous* and *Mercurial*, seem to be *Natures Radical* and *Principal*; the fourteenth is the placing of the *Tangible parts*, in *Length* or *Transverse* (as it is in the *Warp*, and the *Woof* of *Textiles*;) *more inward* or *more outward*, &c. The fifteenth is the *Porosity* or *Imporosity* betwixt the *Tangible parts*, and the *greatness* or *smallness* of the *Pores*; the sixteenth is the *Collocation* and *posture* of the *Pores*. There may be more *causes*, but these do occur for the present.

847.

Experiment
Solitary,
touching
Induration by
Sympathy.

TAKE *Lead* and melt it, and in the midst of it, when it beginneth to congeal, make a little dint or hole, and put *Quick-silver* wrapped in a piece of *Linnen* into that hole, and the *Quick-silver* will fix, and run no more, and endure the Hammer. This is a noble instance of *Induration*, by consent of one Body with another, and *Motion* of *Excitation* to imitate; for to ascribe it only to the *vapor* of *Lead*, is less probable. *Quere*, whether the *fixing* may be in such a degree, as it will be figured like other *Metals*? For if so, you may make Works of it for some purposes, so they come not near the *Fire*.

848.

Experiment
Solitary,
touching
Honey and
Sugar.

SUGAR hath put down the use of *Honey*, insomuch, as we have lost those *Observations* and *preparations* of *Honey*, which the *Ancients* had, when it was more in price. First, it seemeth, that there was in old time *Tree-honey*, as well as *Bee-honey*, which was the *Tear* or *Blood* issuing from the *Tree*; insomuch, as one of the *Ancients* relateth, that in *Trebisond*, there was *Honey* issuing from the *Box-trees*, which made *Men* mad. Again, in ancient time, there was a kind of *Honey*, which either of the own *Nature*, or by *Art*, would grow as hard as *sugar*, and was not so luscious as ours; they had also a *Wine* of *Honey*, which they made thus. They crushed the *Honey* into a great quantity of *Water*, and then strained the *liquor*, after they boiled it in a *Copper* to the half; then they poured it into *Earthen Vessels* for a small time, and after tunned it into *Vessels* of *Wood*, and kept it for many years. They have also, at this day in *Russia*, and those *Northern Countreys*, *Mead-Simple*, which (well made and seasoned) is a good wholesome *Drink*, and very clear. They use also in *Wales*, a Compound *Drink* of *Mead*, with *Herbs* and *Spices*. But mean while it were good, in recompence of that we have lost in *Honey*, there were brought in use a *Sugar-Mead* (for so we may call it) though without any mixture at all of *Honey*; and to brew it, and keep it stale, as they use *Mead*; for certainly, though it would not be so *abstersive*, and *opening*, and *solutive* a *Drink* as *Mead*; yet it will be more grateful to the *Stomach*, and more *lenitive*, and fit to be used in *sharp Diseases*: For we see, that the use of *Sugar* in *Beer* and *Ale*, hath good effects in such cases.

849.

Experiment
Solitary,
touching the
Finer sort of
Base Metals.

IT is reported by the *Ancients*, that there was a kind of *Steel*, in some places, which would polish almost as white and bright as *Silver*. And that there was in *India* a kind of *Brass*, which (being polished) could scarce be discerned from *Gold*. This was in the *Natural Ore*, but I am doubtful, whether *Men* have sufficiently refined *Metals*, which we count *Base*: As whether *Iron*, *Brass*, and *Tin*, be refined to the height? But when they

come

come to such a fineness, as serveth the ordinary use, they try no further.

THere have been found certain *Cements* under *Earth*, that are very soft, and yet taken forth into the Sun, harden as hard as *Marble*: There are also ordinary *Quarries* in *Somerset-shire*, which in the *Quarry* cut soft to any bigness, and in the *Building* prove firm, and hard.

Living *Creatures* (generally) do change their *Hair* with *Age*, turning to be *Gray* and *White*; as is seen in *Men*, though some earlier, some later; in *Horses*, that are Dappled and turn *White*; in *Old Squirrels*, that turn *Grisy*, and many others. So do some *Birds*; as *Cygnets* from *Gray* turn *White*; *Hawks* from *Brown* turn more *White*: And some *Birds* there be, that upon their *Moulting*, do turn *Colour*; as *Robin Redbreasts*, after their *Moulting* grow to be *Red* again by degrees; so do *Gold-Finches* upon the *Head*. The cause is, for that *Moisture* doth (chiefly) colour *Hair*, and *Feathers*, and *Dryness* turneth them *Gray* and *White*; now *Hair* in *Age* waxeth *Dryer*, so do *Feathers*. As for *Feathers*, after *Moulting*, they are young *Feathers*, and so all one as the *Feathers* of young *Birds*. So the *Beard* is younger than the *Hair* of the *Head*, and doth (for the most part) wax *hoary* later. Out of this ground, a *Man* may devise the *Means* of altering the colour of *Birds*, and the *Retardation* of *Hoary-Hairs*. But of this see the *Fifth Experiment*.

The difference between *Male* and *Female*, in some *Creatures*, is not to be discerned, otherwise than in the parts of *Generation*; as in *Horses* and *Mares*, *Dogs* and *Bitches*, *Doves* he and she, and others. But some differ in *magnitude*, and that diversly: For in most the *Male* is the greater; as in *Man*, *Pheasants*, *Peacocks*, *Turkies*, and the like; and in some few, as in *Hawks*, the *Female*. Some differ in the *Hair* and *Feathers*, both in the *quantity*, *crispation*, and *colours* of them; as *He-Lions* are *Hirsute*, and have great *Mains*; the *She's* are smooth like *Cats*, *Bulls*, are more *crisp* upon the *Forehead* than *Cows*; the *Peacock*, and *Pheasant-cock*, and *Goldfinch-cock*, have glorious and fine *colours*; the *Hens* have not. Generally, the he's in *Birds* have the fairest *Feathers*. Some differ in divers *features*; as *Bucks* have *Horns*, *Does* none; *Rams* have more *wreathed Horns* than *Ews*; *Cocks* have great *Combs* and *Spurs*. *Hens* little or none; *Boars* have great *Fangs*, *Sows* much less; the *Turkey-cock* hath great and swelling *Gills* the *Hen* hath less; *Men* have generally deeper and stronger *voices* than *Women*. Some differ in *faculty*, as the *Cocks* amongst *singing Birds*, are the best *singers*. The chief cause of all these (no doubt) is, for that the *Males* have more strength of *heat* than the *Females*, which appeareth manifestly in this, that all young *Creatures* *Males* are like *Females*, and so are *Eunuchs*, and *Gelt Creatures* of all kinds, liker *Females*. Now *heat* causeth *greatness* of *growth*, generally, where there is *moisture* enough to work upon: But if there be found in any *Creature* (which is seen rarely) an over-great *heat* in proportion to the *moisture*, in them the *Female* is the greater; as in *Hawks* and *Sparrows*. And if the *heat* be ballanced with the *moisture*, then there is no difference to be seen between *Male* and *Female*; as in the instances of *Horses* and *Dogs*. We see also, that the *Horns* of *Oxen* and *Cows*, for the most part, are larger than the *Bulls*, which is caused by abundance of *moisture*, which in the *Horns* of the *Bull* faileth. Again, *Heat* causeth *Pilosity*, and *Crispation*; and so likewise *Beards* in *Men*. It also expelleth

850.

Experiment Solitary, touching Cements and Quarries.

851.

Experiment Solitary, touching the Altering of the colour of Hairs and Feathers.

852.

Experiment Solitary, touching the Differences of Living Creatures, Male and Female.

finer *moisture*, which want of heat cannot expel; and that is the *cause* of the *beauty* and *variety* of *Feathers*: Again, *Heat* doth put forth many *Excrecences*, and much solid *matter*, which want of *Heat* cannot do. And this is the *cause* of *Horns*, and of the *greatness* of them; and of the *greatness* of the *Combs*, and *Spurs* of *Cocks*, *Gills* of *Turkey Cocks*, and *Fangs* of *Boars*. *Heat* also dilateth the *Pipes* and *Organs*, which causeth the *deepness* of the *Voice*. Again, *Heat* refineth the *Spirits*, and that causeth the *Cock* singing *Bird* to excel the *Hen*.

853.

Experiment
Solitary,
touching the
Comparative
Magnitude of
Living Crea-
tures.

There be *Fishes* greater than any *Beasts*; as the *Whale* is far greater than the *Elephant*. And *Beasts* are (generally) greater than *Birds*. For *Fishes*, the *cause* may be, that because they live not in the *Air*, they have not their *moisture* drawn, and soaked by the *Air*, and *Sun Beams*. Also they rest always, in a manner; and are supported by the *Water*; whereas *Motion* and *Labor* do consume. As for the *greatness* of *Beasts*, more than of *Birds*, it is caused, for that *Beasts* stay longer time in the *Womb* than *Birds*, and there nourish, and grow; whereas in *Birds*, after the *Egg* laid, there is no further growth, or *nourishment* from the *Female*; for the *sitting* doth *vivifie*, and not nourish.

854.

Experiment
Solitary,
touching
Excoffiation of
Fruits.

WE have partly touched before the *Means* of producing *Fruits*, without *Coars*, or *Stones*. And this we add further, that the *cause* must be abundance of *moisture*; for that the *Coar*, and *Stone*, are made of a dry *Sap*: And we see, that it is possible to make a *Tree* put forth only in *Blossom* without *Fruit*; as in *Cherries* with double *Flowers*, much more in *Fruit* without *Stones*, or *Coars*. It is reported, that a *Cions* of an *Apple*, grafted upon a *Colewort stalk*, sendeth forth a great *Apple* without a *Coar*. It is not unlikely, that if the *inward Pith* of a *Tree* were taken out, so that the *Juyce* came only by the *Bark*, it would work the effect. For it hath been observed, that in *Pollards*, if the *Water* get in on the *top*, and they become hollow, they put forth the more. We add also, that it is delivered for certain by some, that if the *Cions* be grafted, the small ends downwards, it will make *Fruit* have little or no *Coars*, and *Stones*.

855.

Experiment
Solitary,
touching the
Melioration of
Tobacco.

Tobacco is a thing of great price, if it be in request. For an *Acre* of it will be worth (as is affirmed) Two hundred pounds by the year towards charge. The charge of making the *Ground*, and otherwise, is great, but nothing to the profit. But the *English Tobacco* hath small credit, as being too dull and earthy: Nay, the *Virginian Tobacco*, though that be in a hotter climate, can get no credit for the same cause: So that a trial to make *Tobacco* more *Aromatical*, and better concocted here in *England*, were a thing of great profit. Some have gone about to do it, by drenching the *English Tobacco*, in a *Decoction* or *Infusion* of *Indian Tobacco*. But those are but sophistications and toys; for nothing that is once perfect, and hath run his race, can receive much amendment; you must ever resort to the beginnings of things for *Melioration*. The way of *Maturation* of *Tobacco* must (as in other *Plants*) be from the *Heat*, either of the *Earth*, or of the *Sun*. We see some leading of this in *Musk-Melons*, which are sown upon a hot *Bed*, dunded below, upon a *Bank* turned upon the *South Sun*, to give *Heat* by *Reflection*; laid upon *Tiles*, which increaseth the *Heat*; and covered with *Straw*, to keep them from *Cold*; they remove them also, which addeth some *Life*: And by these helps they become as good in *England*,

England, as in Italy, or Provence. These and the like means may be tried in Tobacco. Enquire also of the steeping of the *Roots*, in some such *Liquor*, as may give them Vigor to put forth strong.

Heat of the *Sun*, for the *Maturation* of *Fruits*; yea, and the *heat* of *Vivification* of *Living Creatures*, are both represented and supplied by the *heat* of *Fire*; and likewise, the *heats* of the *Sun*, and *life*, are represented one by the other. *Trees* set upon the *Backs* of *Chimneys*, do ripen *Fruit* sooner. *Vines*, that have been drawn in at the *Window* of a *Kitchen*, have sent forth *Grapes*, ripe a month (at least) before others, *Stoves*, at the *Back* of *Walls*, bring forth *Oranges* here with us. *Eggs*, as is reported by some, have been hatched in the warmth of an *Oven*. It is reported by the *Ancients*, that the *Estrich* layeth her *Eggs* under *Sand*, where the *heat* of the *Sun* discloseth them.

Barley in the *Boyling* swelleth not much; *Wheat* swelleth more, *Rize* extremely; in so much, as a quarter of a *Pint* (unboiled) will arise to a *Pint* boiled. The *cause* (no doubt) is, for that the more close and compact the *Body* is, the more it will dilate. Now *Barley* is the most hollow, *Wheat* more solid than that, and *Rize* most solid of all. It may be also, that some *Bodies* have a kind of *Lentor*, and more *deperitible* nature than others; as we see it evident in *colouration*; for a small *quantity* of *Saffron*; will tinct more, than a very great *quantity* of *Bresl*, or *Wine*.

Fruit groweth sweet by *Rowling* or *Pressing* them gently with the *Hand*; as *Rowling Pears*, *Damasins*, &c. By *Rottenness*; as *Medlars*, *Services*, *Stoes*, *Heps*, &c. By *Time*; as *Apples*, *Wardens*, *Pomegranates*, &c. By certain special *Maturations*; as by *laying* them in *Hay*, *Straw*, &c. And by *Fire*; as in *Roasting*, *Stewing*, *Baking*, &c. The *cause* of the *sweetness* by *Rowling*, and *Pressing* is, *Emollition*, which they properly enduce; as in *beating* of *Stockfish*, *Flesh*, &c. By *Rottenness* is, for that the *Spirits* of the *Fruit*, by *Putrefaction*, gather *heat*, and thereby digest the harder part: For in all *Putrefactions* there is a *degree* of *heat*. By *Time* and *Keeping* is, because the *Spirits* of the *Body*, do ever feed upon the *tangible parts*, and attenuate them. By several *Maturations* is, by some *degree* of *heat*. And by *Fire* is, because it is the proper work of *Heat* to refine, and to incorporate; and all *sourness* consisteth in some *grossness* of the *Body*: And all *incorporation* doth make the *mixture* of the *Body*, more *equal* in all the *parts*, which ever enduceth a milder *taste*.

Of *Fleshes*, some are *edible*; some, except it be in *Famine*, not. For those that are not *edible*, the *cause* is, for that they have (commonly) too much *bitterness* of *taste*; and therefore those *Creatures*, which are fierce and cholerick, are not *edible*; as *Lions*, *Wolves*, *Squirrels*, *Dogs*, *Foxes*, *Horses*, &c. As for *Kine*, *Sheep*, *Goats*, *Deer*, *Swine*, *Conneys*, *Hares*, &c. We see they are *mild*, and *fearful*. Yet it is true, that *Horses* which are *Beasts* of courage, have been and are eaten by some *Nations*; as the *Scythians* were called *Hippophagi*; and the *Chineses* eat *Horse-flesh* at this day; and some *Gluttons* have used to have *Colts-flesh* baked. In *Birds*, such as are *Carnivore* and *Birds* of *Prey*, are commonly no good *Meat*; but the reason is, rather the *Cholerick* Nature of those *Birds*, than their *Feeding* upon *Flesh*; for *Puits*, *Gulls*, *Shovelers*, *Ducks*, do feed upon *Flesh*, and yet are

856.
Experiment
Solitary,
touching
Several Heats
working the
same Effects.

857.
Experiment
Solitary,
touching
Swelling and
Dilatation in
Boyling.

858.
Experiment
Solitary,
touching the
Dulcoration of
Fruits.

859.
Experiment
Solitary,
touching
Flesh Edible,
and not Edible.

good *Meat*. And we see, that those *Birds* which are of *Prey*, or feed upon *Flesh*, are good *Meat*, when they are very *Young*; as *Hawks*, *Rooks* out of the *Nest*, *Owls*, &c. *Mans flesh* is not eaten. The Reasons are three.

First, Because *Men* in *Humanity* do abhor it.

Secondly, Because no *Living Creature*, that dieth of it self, is good to eat; and therefore the *Canibals* (themselves) eat no *Mans flesh*, of those that die of themselves, but of such as are slain.

The third is, Because there must be (generally) some disparity between the *Nourishment*, and the *Body nourished*; and they must not be over-near, or like: Yet we see, that in great *weaknesses* and *Consumptions*, *Men* have been sustained with *Womans Milk*. And *Picinus* fondly (as I conceive) adviseth, for the *Prolongation of Life*, that a *Vein* be opened in the *Arm* of some wholsom *young man*, and the *blood* to be sucked. It is said, that *Witches* do greedily eat *Mans flesh*, which if it be true, besides a *devillish Appetite* in them, it is likely to proceed; for that *Mans flesh* may send up high and pleasing *Vapors*, which may stir the *Imagination*, and *Witches* felicity is chiefly in *Imagination*, as hath been said.

860.

Experiment
Solitary,
touching the
Salamander.

There is an ancient received *Tradition* of the *Salamander*, that it liveth in the *Fire*, and hath force also to extinguish the *fire*. It must have two things, if it be true, to this operation. The one, a very close *skin*, whereby *flame*, which in the midst is not so hot, cannot enter: For we see, that if the *Palm* of the *Hand* be anointed thick with *White of Eggs*, and then *Aquaviva* be poured upon it, and enflamed, yet one may endure the *flame* a pretty while. The other is some *extream cold* and *quenching vertue*, in the *Body* of that *Creature* which choaketh the *fire*. VVe see that *Milk* quencheth *Wild fire* better than *Water*, because it entreth better.

861.

Experiment
Solitary,
touching the
Contrary operations
of
Time, upon
Fruits and
Liquors.

Time doth change *Fruit* (as *Apples*, *Pears*, *Pomegranates*, &c.) from more *sowre* to more *sweet*; but contrariwise, *Liquors*, (even those that are of the *Juice of Fruit*) from more *sweet* to more *sowre*; as, *Wort*, *Must*, *New Verjuice*, &c. The cause is; the *Congregation* of the *Spirits* together; for in both kinds, the *Spirit* is attenuated by *Time*; but in the first kind, it is more diffused, and more mastered by the grosser parts, which the *Spirits* do but digest: But in *Drinks* the *spirits* do reign, and finding less opposition of the parts, become themselves more strong, which causeth also more strength in the *Liquor*; such, as if the *Spirits* be of the hotter sort, the *Liquor* becometh apt to burn; but in time, it causeth likewise, when the higher *Spirits* are evaporated more *sowness*.

862.

Experiment
Solitary,
touching
Blows and
ruises.

It hath been observed by the *Ancients*, that *Plates of Metal*, and especially of *Brass*, applyed presently to a blow, will keep it down from swelling. The cause is *Repercussion*, without *Humectation*, or entrance of any *Body*: For the *Plate* hath only a *virtual cold*, which doth not search into the hurt; whereas all *Plaisters* and *Oyntments* do enter. Surely, the cause that blows and bruises induce swellings is, for that the *spirits* resorting to succor the part that laboreth, draw also the *humors* with them: For we see, that it is not the repulse, and the return of the *humor* in the part stricken that causeth it, for that *Gouts*, and *Tooth-achs* cause swelling, where there is no *Percussion* at all.

The

THe nature of the *Orris Root*, is almost singular, for there be few *odoriferous Roots*; and in those that are in any degree *sweet*, it is but the same *sweetness* with the *Wood* or *Leaf*; But the *Orris* is not *sweet* in the *Leaf*, neither is the *Flower* any thing so *sweet* as the *Root*. The *Root* seemeth to have a tender dainty *heat*, which when it cometh above ground to the *Sun*, and the *Air*, vanisheth: For it is a great *Mollifier*, and hath a smell like a *Violet*.

863.
Experiments
Solitary,
touching the
Orris Root.

IT hath been observed by the *Ancients* that a great *Vessel* full, drawn into *Bottles*; and then the *Liquor* put again into the *Vessel*, will not fill the *Vessel* again, so full as it was, but that it may take in more *Liquor*; and that this holdeth more in *Wine*, than in *Water*. The *cause* may be trivial, namely, by the *expence* of the *Liquor*, in regard some may stick to the sides of the *Bottles*: But there may be a *cause* more subtil, which is, that the *Liquor* in the *Vessel*, is not so much *compressed*, as in the *Bottle*; because in the *Vessel*, the *Liquor* meeteth with *Liquor* chiefly; but in the *Bottles*, a small quantity of *Liquor* meeteth with the sides of the *Bottles*, which compress it so, that it doth not open again.

864.
Experiment
Solitary,
touching the
Compression of
Liquors.

Water being contiguous with *Air* cooleth it, but moisteneth it not, except it *Vapor*. The *cause* is, for that *Heat* and *Cold* have a *Virtual Transition*, without *Communication* of *substance*, but *moisture* not; and to all *madefaction* there is required an *imbibition*: But where the *Bodies* are of such several *Levity*, and *Gravity*, as they mingle not, they can follow no *imbibition*. And therefore, *Oyl* likewise lieth at the *top* of the *Water*, without commixture: And a drop of *Water* running swiftly over a *Straw* or *smooth Body*, wetteth not.

865.
Experiment
Solitary,
touching the
Working of
Water upon
Air contiguous.

Starlight *Nights*, yea, and bright *Moonshine Nights*, are colder than *Cloudy Nights*. The *cause* is, the *dryness* and *Fineness* of the *Air*, which thereby becometh more *piercing* and *sharp*; and therefore great *Continents* are colder than *Islands*. And as for the *Moon*, though it self inclineth the *Air* to *moisture*, yet when it shineth bright, it argueth the *Air* is dry. Also close *Air* is warmer than open *Air*, which (it may be) is, for that the true *cause* of cold, is an *expiration* from the *Globe* of the *Earth*, which in open places is stronger. And again, *Air* it self, if it be not altered by that *expiration*, is not without some secret degree of *heat*; as it is not likewise without some secret degree of *Light*: For otherwise *Cats* and *Owls*, could not see in the *Night*; but that *Air* hath a little *Light*, proportionable to the *Visual Spirits* of those *Creatures*.

866.
Experiment
Solitary,
touching the
Nature of
Air.

THe *Eyes* do move one and the same way; for when one *Eye* moveth to the *Nostril*, the other moveth from the *Nostril*. The *cause* is, *Motion* of *Consent*, which in the *Spirits*, and *Parts Spiritual*, is strong. But yet use will induce the contrary; for some can *squint* when they will. And the common *Tradition* is, that if *Children* beset upon a *Table* with a *Candle* behind them, both *Eyes* will move outwards, as affecting to see the *Light*, and so induce *squinting*.

867.
Experiment
in Consort,
touching the
Eyes and
Sight.

We see more exquisitely with one *Eye* shut, than with both open. The *cause* is, for that the *spirits Visual* unite themselves more, and so become stronger.

868.

stronger. For you may see, by looking in a *Glass*, that when you shut one *Eye*, the *Pupil* of the other *Eye*, that is open, dilateth.

869.

The *Eyes*, if the *sight* meet not in one *Angle*, see things double. The cause is, for that seeing two things; and seeing one thing twice, worketh the same effect: And therefore a little *Pellet*, held between two *Fingers*, laid a cross, seemeth double.

870.

Pore-blind Men, see best in the *dimmer lights*, and likewise have their *sight* stronger near hand, than those that are not *Pore-blind*, and can read and write smaller *Letters*. The cause is, for that the *Spirits Visual*, in those that are *Pore-blind*, are thinner and rarer, than in others; and therefore the greater *light* disperseth them. For the same cause they need contracting; but being contracted, are more strong than the *Visual Spirits* of ordinary eyes are; as when we see thorow a *Level*, the *sight* is the stronger: And so is it, when you gather the *Eye-lids* somewhat close: And it is commonly seen in those that are *Pore-blind*, that they do much gather the *eye-lids* together. But old Men, when they would see to read, put the Paper somewhat a far off. The cause is, for that old Mens *Spirits Visual*, contrary to those of *Pore-blind Men* unite not, but when the object is at some good distance from their *Eyes*.

871.

Men see better when their *Eyes* are over-against the *Sun* or a *Candle*, if they put their *Hand* a little before their *Eye*. The Reason is; for that the *Glaring* of the *Sun*, or the *Candle*, doth weaken the *Eye*; whereas the *Light* circumfused is enough for the *Perception*. For we see, that an over-light maketh the *Eyes* dazel, inso much as perpetual looking against the *Sun*, would cause *Blindness*. Again, if Men come out of a great light, into a dark room; and contrariwise, if they come out of a dark room into a light room, they seem to have a *Mist* before their *Eyes*, and see worse than they shall do after they have staid a little while, either in the *light*, or in the *dark*. The cause is, for that the *Spirits Visual* are upon a sudden change disturbed, and put out of order; and till they be recollected, do not perform their Function well. For when they are much dilated by light, they cannot contract suddenly, and when they are much contracted by darkness, they cannot dilate suddenly. And excess of both these, (that is, of the *Dilatation*, and *Contraction* of the *Spirits Visual*) if it be long, destroyeth the *Eye*. For as long looking against the *Sun*, or *Fire*, hurteth the *Eye* by *Dilatation*, so curious painting in small *Volumes*, and reading of small *Letters*, do hurt the *Eye* by *contraction*.

872.

It hath been observed, that in *Anger* the *Eyes* wax red; and in *Blushing*, not the *Eyes*, but the *Ears*, and the parts behind them. The cause is, for that in *Anger*, the *Spirits* ascend and wax eager; which is most easily seen in the *Eyes*, because they are transluide, though withal it maketh both the *Cheeks*, and the *Gills* red; but in *Blushing*, it is true. the *Spirits* ascend likewise to succor, both the *Eyes* and the *Face*, which are the parts that labor: But when they are repulsed by the *Eyes*, for that the *Eyes*, in shame do put back the *Spirits* that ascend to them, as unwilling to look abroad: For no Man, in that passion, doth look strongly, but dejectedly; and that repulsion from the *Eyes*, diverted the *Spirits* and heat more to the *Ears*, and the parts by them.

873.

The objects of the *Sight*, may cause a great pleasure and delight in the *Spirits*, but no pain or great offence; except it be by *Memory*, as hath been said. The *Glimpses* and *Beams* of *Diamonds* that strike the *Eye*. *Indian Feathers*, that have glorious colours, the coming into a fair *Garden*, the coming into

into a fair Room richly furnished; a beautiful person, and the like, do delight and exhilarate the Spirits much. The reason, why it holdeth not in the offence is, for that the Sight is the most spiritual of the Senses, whereby it hath no object gross enough to offend it. But the cause (chiefly) is, for that there be no active objects to offend the Eye. For Harmonical Sounds, and Discordant Sounds, are both Active and Positive; so are sweet smells, and stinks; so are bitter, and sweets, in tastes; so are over-hot, and over-cold, in touch; but blackness, and darkness, are indeed but privatives; and therefore have little or no Activity. Somewhat they do contristate, but very little.

Water of the Sea, or otherwise, looketh blacker when it is moved, and whiter when it resteth. The cause is, for that by means of the Motion, the Beams of Light pass not straight, and therefore must be darkned, whereas when it resteth, the Beams do pass straight. Besides, splendor hath a degree of whiteness, especially, if there be a little repercussion; for a Looking-Glass with the Steel behind, looketh whiter than Glass simple. This Experiment deserveth to be driven further, in trying by what means Motion may hinder Sight.

Shell-fish have been by some of the Ancients, compared and sorted with the Insecta; but I see no reason why they should, for they have Male and Female, as other Fish have; neither are they bred of Putrefaction, especially such as do move. Nevertheless it is certain, that Oysters and Cockles, and Mussels, which move not, have no discriminate Sex. Quere, in what time, and how they are bred? It seemeth, that Shells of Oysters are bred where none were before; and it is tryed, that the great Horse-Mussel, with the fine shell, that breedeth in Ponds, hath bred within thirty years: But then, which is strange, it hath been tryed, that they do not only gape and shut as the Oysters do, but remove from one place to another.

The Senses are alike strong, both on the right side, and on the left; but the Limbs on the right side are stronger. The cause may be, for that the Brain, which is the Instrument of Sense, is alike on both sides; but Motion, and habilities of moving, are somewhat holpen from the Liver, which lieth on the right side. It may be also, for that the Senses are put in exercise, indifferently on both sides from the time of our Birth; but the Limbs are used most on the right side, whereby custom helpeth: For we see, that some are left-handed, which are such as have used the left-hand most.

Frictions make the parts more fleshy, and full: As we see both in Men, and in the Currying of Horses, &c. The cause is, for that they draw greater quantity of Spirits and Blood to the parts; and again, because they draw the Aliment more forcibly from within, and again because they relax the Pores, and so make better passage for the Spirits, Blood, and Aliment: Lastly, because they dissipate, and digest any Inutile, or Excrementitious moisture, which lieth in the Flesh; all which help Assimilation. Frictions also do more fill and impinguate the Body, than Exercise. The cause is, for that in Frictions, the inward parts are at rest; which in exercise are beaten (many times) too much: And for the same reason (as we have noted heretofore) Gallislaves are fat and fleshy, because they stir the Limbs more, and the inward parts less.

874.
Experiment
Solitary,
touching the
Colour of the
Sea, or other
Water.

875.
Experiment
Solitary,
touching
Shellfish.

876.
Experiment
Solitary,
touching the
Right side and
the Left.

877.
Experiment
Solitary,
touching
Frictions.

878

Experiment
Solitary,
touching
Globes ap-
pearing flat
at distance

ALl Globes a far off, appear flat. The cause is, for that distance, being a secondary object of sight, is not otherwise discerned, than by more or less light, which disparity, when it cannot be discerned, all seemeth one: As it is (generally) in objects not distinctly discerned, for so Letters, if they be so far off, as they cannot be discerned, shew but as *dusky Paper*; and all Engravings and Embossings (a far off) appear plain.

879.

Experiment
Solitary,
touching
Shadows.

THe uttermost parts of Shadows, seem ever to tremble. The cause is, for that the little Moats which we see in the Sun, do ever stir, though there be no Wind; and therefore those moving, in the meeting of the Light and the Shadow, from the Light to the Shadow, and from the Shadow to the Light, do shew the shadow to move, because the Medium moveth.

880.

Experiment
Solitary,
touching the
Rowling and
Breaking of
the Seas.

Shallow and Narrow Seas, break more than deep and large. The cause is, for that the Impulsion being the same in both; where there is a greater quantity of Water, and likewise space enough, there the Water rouleth, and moveth, both more slowly, and with a sloper rise and fall: But where there is less Water, and less space, and the Water dasheth more against the bottom; there it moveth more swiftly, and more in Precipice: For in the breaking of the Waves, there is ever a Precipice.

881.

Experiment
Solitary,
touching the
Dulcoration of
Salt-water.

IT hath been observed by the Ancients, that Salt-water boiled, or boiled and cooled again, is more potable, than of it selfraw; and yet the taste of Salt, in Distillations by Fire, riseth not: For the Distilled Water will be fresh. The cause may be, for that the Salt part of the Water, doth partly rise into a kind of Scum on the top, and partly goeth into a Sediment in the bottom; and so is rather a separation, than an evaporation. But it is too gross to rise into a vapor; and so is a bitter taste likewise: For simple distilled Waters of Wormwood, and the like, are not bitter.

882.

Experiment
Solitary,
touching the
Return of
Saltness in
Pits upon the
Seashore.

IT hath been set down before, that Pits upon the Sea-shores turn into fresh Water, by Percolation of the Salt through the Sand: But it is further noted, by some of the Ancients, that in some places of Africk, after a time, the Water in such Pits will become brackish again. The cause is, for that after a time, the very Sands, thorow which the Salt Water passeth, become Salt; and so the Strainer it self is tinged with Salt. The remedy therefore is to dig still new Pits, when the old wax brackish; as if you would change your Strainer.

883.

Experiment
Solitary,
touching
Attraction by
Similitude of
Substance.

IT hath been observed by the Ancients, that Salt-water will dissolve Salt put into it, in less time, than Fresh Water will dissolve it. The cause may be, for that the Salt in the precedent Water, doth by similitude of Substance, draw the Salt new put in, unto it; whereby it diffuseth in the Liquor more speedily. This is a noble Experiment, if it be true; for it sheweth means of more quick and easie Infusions, and it is likewise a good instance of Attraction by Similitude of Substance. Try it with Sugar put into Water, formerly sugred, and into other Water unsugred.

884.

Experiment
Solitary,
touching
Attraction.

PUt Sugar into Wine, part of it above, part under the Wine; and you shall find (that which may seem strange) that the Sugar above the Wine, will soften and dissolve sooner than that within the Wine. The cause is, for that the

the *Wine* entreth that *part* of the *Sugar* which is under the *Wine*, by simple *Infusion* or *Spreading*; but that *part* above the *Wine* is likewise forced by *Sucking*: For all *Spongy Bodies* expel the *Air*, and draw in *Liquor*, if it be contiguous; as we see it also in *Sponges*, put part above the *Water*. It is worthy the inquiry, to see how you may make more *accurate Infusions*, by help of *Attraction*.

Water in *Wells* is warmer in *Winter* than in *Summer*; and so *Air* in *Caves*. The cause is, for that in the hither parts, under the *Earth*, there is a degree of some heat (as appeareth in *sulphureous Veins*, &c.) which shut close in (as in *Winter*) is the more; but if it perspire (as it doth in *Summer*) it is the less.

It is reported, that amongst the *Leucadians*, in ancient time, upon a superstition, they did use to precipitate a *Man* from a *high Cliff* into the *Sea*; tying about him with strings, at some distance, many great *Fowls*; and fixing unto his *Body* divers *Feathers* spread, to break the fall. Certainly many *Birds* of good *Wing* (as *Kites*, and the like) would bear up a good weight as they flie; and spreading of *Feathers* thin and close, and in great breadth, will likewise bear up a great weight, being even laid without tilting upon the sides. The further extension of this *Experiment* for *Flying*, may be thought upon.

There is in some places (namely, in *Cephalonia*) a little *Shrub*, which they call *Holy-Oak*, or *Dwarf Oak*. Upon the *Leaves* whereof there riseth a *Tumor*, like a *Blister*; which they gather, and rub out of it, a certain red dust, that converteth (after a while) into *Worms*, which they kill with *Wine*, (as is reported) when they begin to quicken: With this *Dust* they Die *Scarlet*.

In *Zant* it is very ordinary, to make *Men* impotent, to accompany with their *Wives*. The like is practised in *Gascony*, where it is called *Nowër l'eguillete*. It is practised always upon the *Wedding day*. And in *Zant*, the *Mothers* themselves do it by way of prevention, because thereby they hinder other *Charms*, and can undo their own. It is a thing the *Civil Law* taketh knowledge of, and therefore is of no light regard.

It is a common *Experiment*, but the cause is mistaken. Take a *Pot*, (or better a *Glass*, because therein you may see the *Motion*) and set a *Candle* lighted in the *Bottom* of a *Bason* of *Water*; and turn the *Mouth* of the *Pot* or *Glass* over the *Candle*, and it will make the *Water* rise. They ascribe it to the drawing of heat, which is not true: For it appeareth plainly to be but a *Motion* of *Nexe*, which they call *Ne detur vacuum*, and it proceedeth thus: The *Flame* of the *Candle* as soon as it is covered, being suffocated by the close *Air*, lesseneth by little and little: During which time, there is some little ascent of *Water*, but not much; for the *Flame* occupying less and less room, as it lesseneth, the *Water* succeedeth. But upon the instant of the *Candles* going out, there is a sudden rise of a great deal of *Water*; for that the *Body* of the *Flame* filleth no more place, and so the *Air* and the *Water* succeed. It worketh the same effect, if instead of *Water*, you put *Flower*, or *Sand*, into the *Bason*: Which sheweth, that it is not the *Flames* drawing the *Liquor*, as *Nourishment*, as it is supposed; for all *Bodies* are alike

885.
Experiment
Solitary,
touching
Heat under
Earth.

886.
Experiment
Solitary,
touching
Flying in the
Air.

887.
Experiment
Solitary,
touching the
Dye of Scarlet.

888.
Experiment
Solitary,
touching
maleficiating.

889.
Experiment
Solitary,
touching the
Rise of Water
by Means of
Flame.

alike unto it, as it is ever in *motion* of *Nexe*; insomuch, as I have seen the *Glass*, being held by the hand, hath lifted up the *Bason*, and all: The *motion* of *Nexe* did so clasp the *bottom* of the *Bason*. That *Experiment*, when the *Bason* was lifted up, was made with *Oyl*, and not with *Water*. Nevertheless this is true, that at the very first *setting* of the *Mouth* of the *Glass*, upon the *bottom* of the *Bason*, it draweth up the *Water* a little, and then standeth at a stay, almost till the *Candles* going out, as was said. This may shew some *Attraction* at first; but of this we will speak more, when we handle *Attractions* by *Heat*.

Experiments
in Consort,
touching the
Influences of
the Moon.

OF the *Power* of the *Celestial Bodies*, and what more secret influences they have, besides the two manifest influences of *Heat* and *Light* we shall speak, when we handle *Experiments* touching the *Celestial Bodies*: Mean while, we will give some *Directions* for more certain *Tryals* of the *Virtue* and *Influences* of the *Moon*, which is our nearest Neighbour.

The *Influences* of the *Moon* (most observed) are four; the *drawing forth* of *Heat*; the *Inducing* of *Putrefaction*; the *increase* of *Moisture*; the *exciting* of the *Motions* of *Spirits*.

890.

For the *drawing forth* of *Heat*, we have formerly prescribed to take *Water* warm, and to set part of it against the *Moon-beams*, and part of it with a *Screen* between; and to see whether that which standeth exposed to the *Beams* will not cool sooner. But because this is but a small *interposition*, (though in the *Sun* we see a small *shade* doth much) it were good to try it when the *Moon* shineth, and when the *Moon* shineth not at all; and with *Water* warm in a *Glass-bottle* as well as in a *Dish*, and with *Cinders*, and with *Iron* red hot, &c.

891.

For the *inducing* of *Putrefaction*, it were good to try it with *Flesh* or *Fish* exposed to the *Moon-beams*, and again exposed to the *Air* when the *Moon* shineth not, for the like time, to see whether will corrupt sooner; and try it also with *Capon*, or some other *fowl* laid abroad, to see whether it will mortifie and become tender sooner. Try it also with dead *Flies* or dead *Worms*, having a little *Water* cast upon them, to see whether will putrefie sooner. Try it also with an *Apple* or *Orange*, having *holes* made in their *tops*, to see whether will rot or mould sooner. Try it also with *Holland Cheese*, having *Vine* put into it, whether will breed *Mites* sooner or greater.

892.

For the *increase* of *Moisture*, the opinion received is, that *Seeds* will grow soonest, and *Hair*, and *Nails*, and *Hedges*, and *Herbs*, cut, &c. will grow soonest, if they be set or cut in the *increase* of the *Moon*: Also, that *Brains* in *Rabbits*, *Wood-cocks*, *Calves*, &c. are fullest in the *Full* of the *Moon*; and so of *Marrow* in the *Bones*, and so of *Oysters* and *Cockles*; which of all the rest are the easiest tried, if you have them in *Pits*.

893.

Take some *Seeds* or *Roots* (as *Onions*, &c.) and set some of them immediately after the *Change*, and others of the same kind immediately after the *Full*: Let them be as like as can be, the *Earth* also the same as near as may be, and therefore best in *Pots*: Let the *Pots* also stand where no *Rain* or *Sun* may come to them, lest the *difference* of the *Weather* confound the *Experiment*. And then see in what time the *Seeds* set, in the *increase* of the *Moon*, come to a certain height, and how they differ from those that are set in the *decrease* of the *Moon*.

It is like, that the *Brain of Man* waxeth *Moister*, and *Fuller*, upon the *Full* of the *Moon*: And therefore it were good for those that have *moist brains*, and are great *Drinkers*, to take *Fume of Lignum Aloes, Rose-mary, Frankincense, &c.* about the full of the *Moon*. It is like also that the *Humors in mens bodies*, increase and decrease, as the *Moon* doth; and therefore it were good to purge some day or two after the *Full*, for that then the *Humors* will not replenish so soon again.

894.

As for the *exciting* of the *motion* of the *spirits*, you must note that the *Growth of Hedges, Herbs, Hair, &c.* is caused from the *Moon*, by *Exciting* of the *spirits*, as well as by *increase* of the *moisture*. But for *Spirits* in particular, the great *Instance* is in *Lunacies*.

895.

There may be other secret *Effects* of the *Influence* of the *Moon*, which are not yet brought into *Observation*. It may be, that if it so fall out, that the *Wind* be *North*, or *North-East*, in the *Full* of the *Moon*, it increaseth *Cold* and if *South* or *South-West*, it disposeth the *Air*, for a good while, to *Warmth*, and *Rain*; which would be observed.

896.

It may be, that *Children* and *young cattel*, that are *Brought forth* in the *Full* of the *Moon*, are stronger and larger, than those that are brought forth in the *Wane*: and those also which are *begotten* in the *Full* of the *Moon*: So that it might be good *Husbandry*, to put *Rams*, and *Bulls* to their *Females*, somewhat before the *Full* of the *Moon*. It may be also, that the *Eggs* lay'd in the *Full of the moon*, breed the better *Birds*: And a number of the like *Effects*, which may be brought into *Observation*: *Quere* also, whether great *Thunders*, and *Earth-Quakes*, be not most in the *Full* of the *Moon*.

897.

THe *Turning* of *Wine* to *Vinegar*, is a Kind of *Putrefaction*: And in *Making* of *Vinegar*, they use to set *Vessels* of *Wine* over against the *Noon-Sun*; which calleth out the more *Oily Spirits*, and leaveth the *Liquor* more *sowre*, and *Hard*. We see also, that *Burnt-Wine* is more *Hard* and *Astringent* than *Wine-unburnt*. It is said, that *Cider* in *Navigations* under the *Line* ripeneth, when *Wine* or *Beer* sowreth. It were good to set a *Rundlet* of *Verjuice* over against the *Sun*, in *Summer*, as they do *Vinegar*, to see whether it will *Ripen*, and *Sweeten*.

898.
Experiment
Solitary,
touching
Vinegar.

THere be divers *Creatures*, that *Sleep* all *Winter*; As the *Bear*, the *Hedgehog*, the *Bat*, the *Bee*, &c. These all wax *Fat* when they *Sleep*, and digest not. The *Cause* of their *Fattening*, during their *Sleeping time*, may be the *Want* of *Assimilating*; For whatsoever *Assimilateth* not to *Flesh*, turneth either to *Sweat*, or *Fat*. These *Creatures*, for part of their *Sleeping time*, have been observed not to *Stirre* at all; And for the other part, to *Stirre*, but not to *Remove*. And they get *Warne* and *Clofe Places* to *sleep* in. When the *Flemmings* wintred in *Nova Zembla*, the *Bears*, about the middle of *November*, went to *sleep*; and then the *Foxes* began to come forth, which durst not before. It is noted by some of the *Ancients*, that the *she-bear* breedeth, and lyeth in with her young, during that time of *Rest*, and that a *Bear*, big with *Young*, hath seldome been seen.

899.
Experiment
Solitary
touching the
Creatures that
sleep all Winter.

Some *Living Creatures* are procreated by *Copulation* between *Male* and *Female*: some by *Putrefaction*; and of those which come by *Putrefaction* many do (nevertheless) afterwards procreate by *Copulation*. For the *cause* of both *Generations*: first, it is most certain, that the *Cause* of all *Vivification*.

900.
Experiment
in Consort
touching the
Generating of
Creatures by
Copulation
and by Putre-
faction.

fication is a gentle and proportionable heat, working upon a glutinous and yielding substance; for the heat doth bring forth spirit in that substance, and the substance being glutinous, produceth two effects; the one, That the spirit is detained, and cannot break forth; the other, That the matter being gentle and yielding, is driven forwards by the motion of the spirits, after some swelling into shape and members. Therefore all sperm, all Menstruous substance, all matter, whereof Creatures are produced by Putrefaction, have evermore a closeness, Lensor, and Sequacity. It seemeth therefore that the Generation by Sperm only, and by Putrefaction, have two different causes. The first is, for that Creatures which have a definite and exact shape (as those have which are procreated by Copulation) cannot be produced by a weak and casual heat; nor out of matter, which is not exactly prepared according to the Species. The second is, for that there is a greater time required for Maturation of perfect Creatures; for if the time required in Vivification be of any length, then the spirit will exhale before the Creature be mature; except it be inclosed in a place where it may have continuance of the heat, access of some nourishment to maintain it, and closeness that may keep it from exhaling; and such places, or the Wombs and Matrices of the Females. And therefore all Creatures made of Putrefaction, are of more uncertain shape, and are made in shorter time, and need not so perfect an enclosure, though some closeness be commonly required. As for the Heathen opinion, which was, That upon great mutations of the World, perfect Creatures were first ingendred of Concretion, as well as Frogs, and Worms, and Flies, and such like, are now; we know it to be vain: But if any such thing should be admitted, discoursing according to sense, it cannot be, except you admit of a Chaos first, and commixture of Heaven and Earth; for the Frame of the World once in order, cannot effect it by any excess or casualty.



NATURAL HISTORY;

Century X.



THe Philosophy of Pythagoras (which was full of Superstition) did first plant a *Monstrous Imagination*, which afterwards was, by the School of Plato, and others, watered and nourished. It was, That *the World was one, entire, perfect, Living Creature*; insomuch, as Apollonius of Tyana, a Pythagorean Prophet, affirmed, That the *Ebbing and Flowing of the Sea* was the *Respiration of the World*, drawing in *Water as Breath*, and putting it forth again. They went on, and inferred, That if the *World* were a *Living Creature*, it had a *Soul and Spirit*; which also they held, calling it *Spiritus Mundi*, the *Spirit or soul of the World*, by which, they did not intend *God*, (for they did admit of a *Deity* besides) but only the *Soul, or Essential Form of the Universe*. This *Foundation* being laid, they might build upon it what they would; for in a *Living Creature*, though never so great (as for example, in a great *Whale*) the *Sense* and the *Affects* of any one part of the *Body* instantly make a *Transcursion* throughout the whole *Body*: So that by this they did insinuate, that no *distance of place*, nor *want or indisposition of Matter* could hinder *Magical Operations*; but that (for example) we might here in *Europe* have *Sense and Feeling* of that which was done in *China*; and likewise, we might work any *effect without and against Matter*: And this not holden by the *co-operation of Angels or Spirits*, but only by the *Unity and Harmony of Nature*. There were some also that staid not here, but went further, and held, That if the *Spirit of Man* (whom they call the *Microcosm*) do give a fit touch to the *Spirit of the World*, by strong *Imaginations and Beliefs*, it might command *Nature*; for *Paracelsus*, and some darksome *Authors of Magick*, do ascribe to *Imagination* exalted the *Power of Miracle-working Faith*. With these vast and bottomless *Follies* Men have been (in part) entertained.

Experiments
in Consort
touching the
Transmission,
and *Influx*, of
Immaterial
Vertues, and
the *Force of*
Imagination.

But we, that hold firm to the *Works of God*, and to the *Sense*, which is *Gods Lamp*, (*Lucerna Dei Spiraculum Hominis*;) will enquire with all Sobriety and Severity, whether there be to be found in the Foot-steps of Nature any such *Transmission*, and *Influx of Immaterial Virtues*; and what the force of *Imagination* is, either upon the *Body Imaginant*, or upon another *Body*: Wherein it will be like that *labour of Hercules* in purging the *Stable of Augeas*, to separate from *Superstitious* and *Magical Arts* and *Observations*, any thing that is clean and pure *Natural*, and not to be either contemned or condemned. And although we shall have occasion to speak of this in more places than one; yet we will now make some entrance thereinto.

901.
Experiments
in Confort,
Monitory,
touching
Transmission
of Spirits, and
the Force of
Imagination.

MEN are to be admonished, that they do not withdraw credit from the *Operations* by *Transmission of Spirits*, and *Force of Imagination*, because the effects fail sometimes. For as in *Infection* and *Contagion* from *Body to Body*, (as the *Plague*, and the like) it is most certain, that the *Infection* is received (many times) by the *Body Passive*, but yet is by the strength and good disposition thereof repulsed, and wrought out, before it be formed into a *Disease*; so much more in *Impressions* from *Mind to Mind*, or from *Spirit to Spirit*, the *Impression* taketh, but is encountred and overcome by the *Mind* and *Spirit*, which is *Passive*, before it work any manifest effect: And therefore they work most upon weak *Minds* and *Spirits*; as those of *Women*, *Sick Persons*, *Superstitious* and *fearful Persons*, *Children*, and *young Creatures*.

Nescio quis teneros oculus mihi fascinat Agnos:

The *Poet* speaketh not of *Sheep*, but of *Lambs*. As for the *weakness* of the *Power* of them upon *Kings* and *Magistrates*, it may be ascribed (besides the main, which is the *Protection* of *God* over those that execute his place) to the *weakness* of the *Imagination* of the *Imaginant*; for it is hard for a *Witch* or a *Sorcerer* to put on a belief, that they can hurt such persons.

902.

MEN are to be admonished on the other side, that they do not easily give place and credit to these *operations*, because they *succeed many times*: For the cause of this success is (oft) to be truly ascribed unto the force of *Affection* and *Imagination* upon the *Body Agent*, and then by a *secondary means* it may work upon a *diverse Body*. As for example, If a man carry a *Planets Seal* or a *Ring*, or some part of a *Beast*, believing strongly that it will help him to obtain his *Love*, or to keep him from danger of hurt in *Fight*, or to prevail in a *Suit*, &c. it may make him more *active* and *industrious*; and again, more *confident* and *persisting*, than otherwise he would be. Now the great effects that may come of *Industry* and *Perseverance* (especially in *civil business*) who knoweth not? For we see *audacity* doth almost bind and mate the *weaker sort of Minds*; and the state of *Humane Actions* is so variable, that to try things oft, and never to give over, doth wonders: Therefore it were a meer *fallacy* and *mistaking* to ascribe that to the *Force of Imagination* upon another *Body*, which is but the *Force of Imagination* upon the proper *Body*; for there is no doubt but that *Imagination* and *vehement Affection* work greatly upon the *Body* of the *Imaginant*, as we shall shew in due place.

903.

MEN are to be admonished, that as they are not to mistake the causes of these *operations*, so much less they are to mistake the *Fact* or *Effect*, and rashly to take that for done which is not done. And therefore, as divers wise *Judges* have prescribed and cautioned, *Men* may not too rashly believe

believe the *Confessions* of *Witches*, nor yet the evidence against them : For the *Witches* themselves are *Imaginative*, and believe oft-times they do that which they do not ; and people are *credulous* in that point, and ready to impute *Accidents* and *Natural Operations* to *Witchcraft*. It is worthy the observing, that both in *Ancient* and *late times*, (as in the *Thessalian Witches*, and the meetings of *Witches*, that have been recorded by so many late *Confessions*) the great wonders which they tell of carrying in the *Air*, transforming themselves into other *Bodies*, &c. are still reported to be wrought, not by *Incantation* or *Ceremonies*, but by *Ointments* and *Anointing* themselves all over. This may justly move a *Man* to think, that these *Fables* are the effects of *Imagination* ; for it is certain, that *Ointments* do all (if they be laid on any thing thick) by stopping of the *Pores*, shut in the *Vapors*, and send them to the *Head* extremly. And for the particular *Ingredients* of those *Magical Ointments*, it is like they are *opiate* and *soporiferous*. For *Anointing* of the *Forehead*, *Neck*, *Feet*, *Back-bone*, we know is used for procuring *dead sleeps*. And if any *Man* say, that this effect would be better done by inward *potions* ; answer may be made, that the *Medicines* which go to the *Ointments* are so strong, that if they were used inwards, they would kill those that use them ; and therefore they work potently, though outwards.

We will divide the several kinds of the operations by transmission of *Spirits* and *Imagination*, which will give no small light to the *Experiments* that follow. All operations by transmission of *Spirits* and *Imagination* have this, that they work at distance, and not at touch ; and they are these being distinguished.

The first is, the *Transmission* or *Emission* of the thinner, and more airy parts of *Bodies*, as in *Odors* and *Infections* ; and this is, of all the rest, the most corporeal. But you must remember withal, that there be a number of those *Emissions*, both *wholesome* and *unwholesome*, that give no smell at all : For the *Plague* many times when it is taken giveth no sent at all, and there be many good and *healthful Airs*, that do appear by *Habitation*, and other proofs, that differ not in *Smell* from other *Airs*, and under this head you may place all *Imbibitions* of *Air*, where the substance is *material*, *odor-like* ; whereof some nevertheless are strange, and very suddenly diffused ; as the alteration which the *Air* receiveth in *Egypt* almost immediately upon the rising of the *River of Nilus*, whereof we have spoken.

904.

The second is, the *Transmission* or *Emission* of those things that we call *Spiritual Species*, as *Visibles* and *Sounds* ; the one whereof we have handled, and the other we shall handle in due place. These move swiftly and at great distance, but then they require a *Medium* well disposed, and their *Transmission* is easily stopped.

905.

The third is, the *Emissions* which cause *Attraction* of certain *Bodies* at distance ; wherein though the *Loadstone* be commonly placed in the first rank, yet we think good to except it, and refer it to another Head : But the drawing of *Amber*, and *Jet*, and other *Electrick Bodies*, and the *Attraction* in *Gold* of the *Spirit of Quick silver* at distance, and the *Attraction* of *Heat* at distance, and that of *fire* to *Naphtha*, and that of some *Herbs* to *Water*, though at distance, and divers others, we shall handle, but yet not under this present title, but under the title of *Attraction* in general.

906.

907.

The fourth is, the *Emission of Spirits*, and *Immateriate Powers* and *Virtues*, in those things which work by the *universal configuration* and *Sympathy* of the *World*; not by *Forms*, or *Celestial Influxes*, (as is vainly taught and received) but by the *Primitive Nature* of *Matter*, and the *seeds of things*. Of this kind is (as we yet suppose) the *working of the Loadstone*, which is by *consent* with the *Globe of the Earth*; of this kind is the *motion of Gravity*, which is by *consent of dense Bodies* with the *Globe of the Earth*: Of this kind is some *disposition of Bodies to Rotation*, and particularly from *East to West*; of which kind, we conceive the *Main Float and Refloat of the Sea* is, which is by *consent of the Universe*, as part of the *Diurnal Motion*. These *Immateriate Virtues* have this property differing from others, that the *diversity of the Medium* hindreth them not, but they pass, through all *Mediums*, yet at *determinate distances*. And of these we shall speak, as they are incident to several *Titles*.

908.

The fifth is, the *Emission of Spirits*; and this is the principal in our intention to handle now in this place, namely, the *operation of the Spirits of the mind of Man* upon other *Spirits*; and this is of a *double nature*, the *operation of the Affections*, if they be vehement; and the *operation of the Imagination* if it be strong. But these two are so coupled, as we shall handle them together; for when *envious* or *amorous aspect* doth infect the *Spirits of another*, there is joyned both *Affection* and *Imagination*.

909.

The sixth is, the *influxes of the Heavenly Bodies*, besides those two manifest ones of *Heat* and *Light*. But these we will handle, where we handle the *Celestial Bodies and Motions*.

910.

The seventh is, the *operations of Sympathy*, which the *Writers of Natural Magick* have brought into an *Art or Precept*; and it is this, That if you desire to super-induce any *Virtue* or *Disposition* upon a *Person*, you should take the *Living Creature*, in which that *Virtue* is most eminent and in *perfection*; of that *Creature* you must take the *parts* wherein that *Virtue* chiefly is *collocate*. Again, you must take the *parts* in the *time*, and *act* when that *Virtue* is most in *exercise*, and then you must apply it to that *part of Man*, wherein that *Virtue* chiefly *consisteth*. As if you would super-induce *Courage* and *Fortitude*, take a *Lion*, or a *Cock*; and take the *Heart*, *Tooth*, or *Paw* of the *Lion*; or the *Heart*, or *Spur* of the *Cock*; take those *parts* immediately after the *Lion* or the *Cock* have been in *fight*, and let them be worn upon a *Mans heart* or *wrist*. Of these and such like *Sympathies* we shall speak under this present *Title*.

911.

The eighth and last is, an *Emission of Immateriate Virtues*, such as we are a little doubtful to propound it is so prodigious, but that it is so constantly avouched by many: And we have set it down as a *Law* to our selves to examine things to the bottom, and not to receive upon credit, reject upon improbabilities, until there hath passed a due examination. This is the *Sympathy of Individuals*; for as there is a *Sympathy of Species*, so (it may be) there is a *Sympathy of Individuals*; that is, that in *things*, or the *parts of things* that have been once *contiguous* or *entire*, there should remain a *transmission of Virtue* from the one to the other, as between the *Weapon* and the *Wound*. Whereupon is blazed abroad the *operation of Unguentum Teli*; and so of a *piece of Lard*, or *Stick*, of *Elder*, &c. That if *part* of it be consumed or putrefied, it will work upon the other *parts severed*. Now we will pursue the *instances* themselves.

The

THe *Plague* is many times taken without manifest sense, as hath been said; and they report, that where it is found it hath a sent of the smell of a *Mellow Apple*, and (as some say) of *May-flowers*: And it is also received, that smells of Flowers that are *Mellow* and *Lushious*, are ill for the *Plague*; as *Wite Lilies*, *Cowslips*, and *Hyacinths*.

912.
Experiments
in Confort,
touching
Emission of
Spirits in Va-
por or exha-
lation Odoi-
like.

The *Plague* is not easily received by such as continually are about them that have the *Plague*, as *Keepers* of the *Sick*, and *Physitians*; nor again by such as take *Antidotes*, either inward (as *Mithridate*, *Juniper-berries*, *Rue*, *Leaf*, and *Seed*, &c.) or outward (as *Angelica*, *Zedoary*, and the like in the Mouth; *Tar*, *Galbanum*, and the like in Perfume:) Nor again, by old people and such as are of a dry and cold complexion. On the other side, the *Plague*, taketh soonest hold of those that come out of a fresh Air, and of those that are fasting, and of Children; and it is likewise noted to go in a Blood more than to a stranger.

913.

The most pernicious Infection, next the *Plague*, is the Smell of the *Jayl*, when *Prisoners* have been long, and close, and nastily kept; whereof we have had in our time, experience twice or thrice, when both the *Judges* that sat upon the *Jayl*, and numbers of those that attended the business, or were present, sickned upon it, and died. Therefore it were good wisdom, that in such cases the *Jayl* were aired before they be brought forth.

914.

Out of question, if such foul smells be made by Art, and by the Hand, they consist chiefly of *Mans flesh*, or *sweat putrefied*; for they are not those stinks which the *Nostrils* straight abhor and expel, that are most pernicious, but such *Airs* as have some similitude with *Mans body*, and so insinuate themselves, and betray the *Spirits*. There may be great danger in using such Compositions in great Meetings of People within Houses; as in *Churches*, at *Arraignments*, at *Plays* and *Solemnities*, and the like: For poisoning of Air is no less dangerous, than poisoning of Water, which hath been used by the *Turks* in the Wars, and was used by *Emanuel Commenus* towards the *Christians*, when they passed through his Countreys to the Holy Land. And these empoisonments of Air are the more dangerous in Meetings of People, because the much breath of People doth further the reception of the Infection. And therefore when any such thing is feared, it were good those publick places were perfumed before the Assemblies.

915.

The empoisonment of particular persons by Odors, hath been reported to be in perfumed Gloves, or the like. And it is like they mingle the poison that is deadly with some smells that are sweet, which also maketh it the sooner received. *Plagues* also have been raised by Anointings of the Chinks of Doors, and the like; not so much by the touch, as for that it is common for men, when they find any thing wet upon their fingers, to put them to their Nose; which men therefore should take heed how they do. The best is, that these Compositions of Infectious Airs cannot be made without dangers of death to them that make them; but then again, they may have some Antidotes to save themselves; so that men ought not to be secure of it.

916.]

There have been in divers Countreys great Plagues by the Putrefaction of great swarms of *Grashoppers* and *Locusts*, when they have been dead and cast upon heaps.

917.

It hapneth oft in Mines, that there are Damps which kill either by Suffocation, or by the poysonous nature of the Mineral; and those that deal

918.

deal much in *Refining*, or other works about *Metals* and *Minerals*, have their *Brains* hurt and stupefied by the *Metalline Vapors*. Amongst which, it is noted, that the *Spirits* of *Quick-silver* ever flie to the *Skull*, *Teeth*, or *Bones*. insomuch, as *Gilders* use to have a piece of *Gold* in their *Mouth* to draw the *Spirits* of the *Quick-silver*; which *Gold* afterwards they find to be whitened. There are certain *Lakes* and *Fits*, such as that of *Avernus*, that *poysen Birds* (as is said) which fly over them, or *Men* that stay too long about them.

919. The *Vapour* of *Char-coal* or *Sea-coal* in a close room, hath killed many; and it is the more dangerous, because it cometh without any ill smell but stealeth on by little and little, inducing onely a faintness, without any manifest strangling. When the *Dutchmea* wintred at *Nova Zembla*, and that they could gather no more sticks, they fell to make fire of some *Sea-coal* they had, wherewith (at first) they were much refreshed; but a little after they had set about the fire, there grew a general silence and lothness to speak amongst them; and immediately after one of the weakest of the *Company* fell down in a swoon: Whereupon, they doubting what it was, opened their door to let in *Air*, and so saved themselves. The effect (no doubt) is wrought by the inspissation of the *Air*, and so of the *Breadth* and *Spirits*. The like ensueth in *Rooms* newly *Plaiſtred*, if a fire be made in them; whereof no less *Man* then the *Emperor Jovinianus* died.

920. Vide the Experiment 803. Touching the Infectious Nature of the *Air* upon the first showers after long Drought.

921. It hath come to pass, that some *Apothecaries*, upon stamping of *Coloquintida*, have been put into a great Scouring by the vapor only.

922. It hath been a practice to burn a *Pepper* they call *Guiny Pepper*, which hath such a strong Spirit, that it provoketh a continual Sneezing in those that are in the Room.

923. It is an Ancient Tradition, that *Blear eyes* infect *Sound eyes*; and that a *Menstruous Woman* looking upon a *Glass* doth rust it: nay, they have an opinion, which seemeth fabulous, That *Monstruous Women* going over a *Field* or *Garden*, do *Corn* and *Herbs* good by killing the *Worms*.

924. The Tradition is no less ancient, that the *Basilisk* killeth by aspect; and that the *Woof*, if he seeth a *Man* first, by aspect striketh a *Man* horle.

925. Perfumes convenient to dry and strengthen the *Brain*, and stay *Rheums* and *Defluxions*; as we find in *Fume* of *Rosemary* dried, and *Lignum*, *Aloes*, and *Calamus* taken at the *Mouth* and *Nostrils*. And no doubt, there be other Perfumes that do moisten and refresh, and are fit to be used in *Burning Agues*, *Consumptions*, and too much *Wakefulness*; such as are *Rose-water*, *Vinegar*, *Lemmon-pills*, *Violets*, the *Leaves* of *Vines* sprinkled with a little *Rose-water* &c.

926. They do use in sudden Faintings and Swoonings, to put a *Handkerchief*, with *Rose-water*, or a little *Vinegar* to the *Nose*, which gathereth together again the *Spirits*, which are upon point to resolve and fall away.

927. Tobacco comforteth the *Spirits* and dischargeth weariness; which it worketh, partly by opening, but chiefly by the opiate Vertue, which condenseth the *Spirits*. It were good therefore to try the taking of *Fumes* by *Pipes* (as they do in *Tobacco*) of other things, as well to dry and comfort, as for other intentions. I wish tryal be made of the drying *Fume* of *Rosemary* and *Lignum Aloes*, before mentioned in *Pipe*; and so of *Nutmegs* and *Eolium Indum*, &c.

The following of the Plough hath been approved for refreshing the Spirits, and procuring Appetite; but to do it in the Ploughing for Wheat or Rye is not so good, because the Earth hath spent her sweet breath in Vegetables put forth in Summer. It is better therefore to do it when you sow Barley. But because Ploughing is tied to Seasons, it is best to take the Air of the Earth new turned up by digging with the Spade, or standing by him that diggeth. Gentlemen may do themselves much good by kneeling upon a Cushion, and Weeding. And these things you may practise in the best Seasons, which is ever the early Spring, before the Earth putteth forth the Vegetables, and in the sweetest Earth you can chuse. It would be done also when the Dew is a little off the Ground, lest the Vapor be too moist. I knew a great Man that lived long, who had a clean Clod of Earth brought to him every morning as he sate in his Bed; and he would hold his head over it a good pretty while. I commend also sometimes in digging of new Earth, to pour in some Malmsey or Greek Wine, that the Vapor of the Earth and Wine together may comfort the Spirits the more; provided always it be not taken for a Heathen Sacrifice or Libation to the Earth.

928.

They have in Physick use of Pomanders, and knots of Powders for drying of Rheums, comforting of the Heart, provoking of Sleep, &c. for though those things be not so strong as Perfumes, yet you may have them continually in your hand, whereas Perfumes you can take but at times; and besides, there be divers things that breath better of themselves than when they come to the Fire; as *Nigella Romana*, the Seed of *Melanthium*, *Amomum*, &c.

929.

There be two things which (inwardly used) do cool and condense the Spirits; and I wish the same to be tried outwardly in Vapors. The one is Nitre; which I would have dissolved in Malmsey, or Greek Wine, and so the smell of the Wine taken; or, if you would have it more forcible, pour of it upon a Fire-pan well heated, as they do Rose-water and Vinegar. The other is, the distilled Water of Wild Poppy; which I wish to be mingled at half with Rose water, and so taken with some mixture of a few Cloves in a Perfuming-pan. The like would be done with the distilled Water of Saffron-Flowers.

930.

Smells of Musk, and Amber, and Civit, are thought to further Venereous Appetite; which they may do by the refreshing and calling forth of the Spirits.

931.

Incense and Nidorous smells (such as were of Sacrifices) were thought to intoxicate the Brain, and to dispose men to devotion; which they may do by a kind of sadness and contristation of the Spirits, and partly also by Heating and Exalting them. We see that amongst the Jews, the principal perfume of the Sanctuary was forbidden all common uses.

932.

There be some Perfumes prescribed by the Writers of Natural Magick, which procure pleasant Dreams; and some others (as they say) that procure Prophetical Dreams, as the Seeds of Flax, Fleawort, &c.

933.

It is certain, that Odors do in a small degree, nourish, especially the Odor of Wine; and we see Men an hundred do love to smell hot Bread. It is related, that *Democritus* when he lay a dying, heard a Woman in the House complain, that she should be kept from being at a Feast and Solemnity (which she much desired to see) because there would be a Corps in the House: Whereupon he caused Loaves of new Bread to be sent for, and opened them, and poured a little Wine into them, and so kept himself alive with the

934.

the Odor of them till the Feast was past. I knew a Gentleman that would fast (sometimes) three or four, yea, five days; without Meat, Bread, or Drink; but the same Man used to have continually a great Wisp of Herbs that he smelled on, and amongst those Herbs some esculent Herbs of strong sent, as Onions, Garlick, Leeks, and the like.

935. They do use for the Accident of the Mother to burn Feathers, and other things of ill Odor; and by those ill smells the rising of the Mother is put down.

936. There be Airs which the Physitians advise their Patients to remove unto in Consumptions, or upon recovery of long sicknesses, which (commonly) are plain Champaigns, but Grasing, and not overgrown with Heath, or the like; or else Timber-shades, as in Forests, and the like. It is noted also, that Groves of Bays do forbid Pestilent Airs; which was accounted a great cause of the wholesome Air of Antiochia. There be also some Soyls that put forth Odorate Herbs of themselves, as Wild Thyme, Wild Majoram, Penny royal, Camomile; and in which, the Bryar-Roses smell almost like Musk Roses; which (no doubt) are signs that do discover an excellent Air.

937. It were good for men to think of having healthful Air in their Houses; which will never be, if the Rooms be low Roofed, or full of Windows and Doors; for the one maketh the Air close, and not fresh; and the other maketh it exceeding unequal, which is a great enemy to health. The Windows also should not be high up to the Roof (which is in use for Beauty and Magnificence) but low. Also Stone-Walls are not wholesome; but Timber is more wholesome, and especially Brick. Nay, it hath been used by some with great success, to make their Walls thick, and to put a Lay of Chalk between the Bricks to take away all dampishness.

938.
Experiment
Solitary,
touching
Emissions of
Spiritual
Species which
affect the senses.

THESE Emissions (as we said before) are handled, and ought to be handled by themselves, under their Proper Titles, that is, *Visibles*, and *Audibles*, each a part. In this place, it shall suffice to give some general Observations common to both. First, they seem to be *Incorporeal*. Secondly, they work *swiftly*. Thirdly, they work at *large distances*. Fourthly, in *curious varieties*. Fifthly, they are not *effective* of any thing, nor leave no work behind them, but are *energies* meerly; for their working upon mirrors and places of *Eccho* doth not alter any thing in those Bodies: but it is the same Action with the Original; onely *repercussed*. And as for the shaking of Windows, or rarifying the Air by great noises, and the Heat caused by Burning-Glasses, they are rather *Concomitants* of the Audible and Visible Species, than the effects of them. Sixthly, they seem to be of so *tender* and *weak* a Nature, as they effect onely such a Rare and Attenuate Substance, as is the Spirit of Living Creatures.

939.
Experiments
in Consort
touching the
Emission of Im-
material Ver-
tues from the
Minds, and
Spirits of Men,
either by Affe-
ctions, or by
Imaginations,
or by other Im-
pressions.

IT is mentioned in some Stories, that where Children have been exposed or taken away young from their Parents, and that afterward they have approached to their Parents presence, the Parents (though they have not known them) have had a secret Joy, or other Alteration thereupon,

There was an Egyptian Sooth-sayer that made *Anthony* believe, that his genius (which otherwise was brave and confident) was, in the presence of *Octavianus Caesar*, poor and cowardly; and therefore, he advised him to absent himself (as much as he could) and remove far from him. The Sooth-sayer was thought to be suborned by *Cleopatra*, to make him live in Egypt, and other

remote

Remote Places from Rome. Howsoever the Conceit of a Predominant or Mastering Spirit, of one Man over another, is Ancient, and received still, even in *Vulgar Opinion*.

There are Conceits, that some Men, that are of an *Ill*, and *Melancholy* Nature, do incline the Company, into which they come, to be *Sad*, and *Ill disposed*; And contrariwise, that Others, that are of a *Jovial Nature*, do dispose the Company to be *Merry* and *Cheerful*. And again, that some are *Lucky* to be kept Company with, and *Employd*; And Others *Vnlucky*. Certainly, it is agreeable to Reason, that there are, at the least, some *Light Refractions* from Spirit to Spirit, when Men are in Presence one with another, as well as from Body to Body.

941.

It hath been observed, that *Old Men*, who have loved *Young company*, and been *Conversant* continually with them, have been of *Long Life*; Their *Spirits* (as it seemeth,) being recreated by such company. Such were the *Ancient Sophists*, and *Rhetoricians*, which ever had *young Auditors* and *Disciples*; as *Gorgias*, *Protagoras*, *Isocrates*, &c. who lived till they were an hundred years old. And so likewise did many of the *Grammarians*, and *School-Masters*; such as was *Orbillius*, &c.

942.

Audacity and *confidence* doth, in civil business, so great Effects, as a Man may (reasonably) doubt, that besides the very *Daring*, and *Earnestness*, and *Persisting*, and *Importunity*, there should be some *Secret binding*, and *Stooping* of other Mens *Spirits* to such Persons.

943.

The *Affections* (no doubt) do make the *Spirits* more powerful, and *Active*; and especially those *Affections*, which draw the *Spirits* into the *Eyes*: which, are two, *Love* and *Envy*, which is called *Oculus Malus*. As for *Love*, the *Platonists* (some of them) go so far, as to hold, that the *Spirit* of the *Lover* doth pass into the *Spirits*, of the *Person Loved*, which causeth the desire of return into the *Body*, whence it was *Emitted*, whereupon followeth that appetite of *contact* and *conjunction* which is in *Lovers*. And this is observed likewise, that the *Aspects* that procure *Love*, are not *Gazings*, but *Sudden Glances*, and *Dartings* of the *Eye*. As for *Envy*, that emitteth some *Maligne* and *Poysonous Spirit*, which taketh hold of the *Spirit* of another; and is likewise of greatest Force, when the cast of the *Eye* is *Oblick*. It hath been noted also, that it is most dangerous, when an *envious eye* is cast upon *Persons* in *Glory*, and *Triumph*, and *Joy*. The reason whereof is, for that, at such times, the *Spirits* come forth most into the *Outward parts*, and so meet the *Percussion* of the *Envious Eye*, more at *Hand*: And therefore it hath been noted, that after great *Triumph*, Men have been ill disposed, for some *Dayes* following. We see the opinion of *Fascination* is Ancient, for both Effects of *Procuring Love*; and *sickness* caused by *Envy*: and *Fascination* is ever by the *Eye*. But yet if there be any such *Infection* from *Spirit* to *Spirit*, there is no doubt, but that it worketh by *Presence*, and not by the *Eye* alone, yet most forcibly by the *Eye*.

944.

Fear and *Shame*, are likewise *Infective*, for we see that the *starting* of one, will make another ready to *Start*: And when one man is out of countenance in a company, others do likewise *Blush* in his behalf.

945.

Now we will speak of the Force of *Imagination* upon other *Bodies*; and of the means to exalt and strengthen it. *Imagination*, in this place, I understand to be, the representation of an *Individual thought*. *Imagination* is of three kinds: the first *Joynd* with *Belief* of that which is to come: the Second *joynd* with *Memory* of that which is *Past*: And the third is of *Things Present*, or as if they were *Present*; For I comprehend in this *Imagination*

Feigned

feigned, and at Pleasure; As if one should *Imagine* such a *Man* to be in the *Vestments* of a *Pope*; or to have *Wings*. I single out, for this time, that which is with *Faith*, or *Belief* of that which is to come. The *Inquisition* of this *Subject*, in our way, (which is by *induction*), is wonderful hard, for the *Things* that are reported, are full of *Fables*; and *new Experiments* can hardly be made, but with extream caution, for the reason which we will hereafter declare.

The *Power* of *Imagination* is in three kinds; The first upon the *Body* of the *Imaginant*, including likewise the *Child* in the *Mother's Womb*; the second is, the *Power* of it upon *Dead Bodies*; as *Plants*, *Wood*, *Stone*, *Metal*, &c. The third is, the *Power* of it, upon the *Spirits* of *Men*, and *Living Creatures*. And with this last we will only meddle.

The *Problem* therefore is, whether a *Man* constantly and strongly believing, that such a *Thing* shall be; (As that such an *one* will *Love* him or that such an *one* will *Grant* him his *request*, or that such an *one* shall *recover* a *sickness*, or the like) it doth help any thing to the *Effecting* of the *Thing* it selfe. And here again we must warily distinguish; For it is not meant, (as hath been partly said before) that it should help by *Making* a *Man* more *Stout*, or more *Industrious*: (In which kind a *Constant belief* doth much) but meerly by a *secret operation*, or *binding*, or *changing* the *spirit* of another: And in this it is hard, (as we began to say) to make any *new Experiment* for I cannot *command* my self to believe what I will, and so no *Tryal* can be made. Nay it is worse, for whatsoever a *Man* *Imagineth* doubtingly, or with *fear*, must needs do hurt, if *Imagination* have any *Power* at all; for a *Man* representeth that oftner, that he feareth, than the contrary.

The *Help* therefore is, for a *Man* to work by another, in whom he may Create *Belief*, and not by himself, until himself have found by *Experience* that *Imagination* doth prevail; for then *Experience* worketh in himself believing, if the belief, that such a *Thing* shall be, be joyned with a belief, that his *Imagination* may procure it.

946.

For example; I related one time to a *man*, that was curious and vain enough in these things; that I saw a kind of *Jugler* that had a *Pair* of *Cards*, and would tell a *Man* what *Card* he thought. This pretended learned man told me it was a mistaking in me. For (said he) it was not the knowledge of the mans thought, (for that is proper to *God*) but it was the inforcing of a thought upon him, and binding his *Imagination* by a stronger, that he could think no other *Card*. And thereupon he asked me a *Question*, or two which I thought he did but cunningly, knowing before what used to be the *feats* of the *Jugler*. Sir, (said he) do you remember whether he told the *Card*, the *Man* thought himself, or bade another to tell it. I answered (as was true) That he bade another tell it. Whereunto he said; so I thought: for (said he) himself could not have put on so strong an *Imagination*, but by telling the other the *Card*, (who believed that the *Jugler* was some strange *Man* and could do strange things) that other *Man* caught a strong *Imagination*. I harkened unto him, thinking for a vanity he spoke prettily. Then he asked me another *question*: saith he; do you remember, whether he bade the *Man* think the *Card* first, and afterwards told the other man in his *Ear*, what he should think, or else that he did whisper first in the *Mans* ear, that should tell the *card*, telling that such a man should think such a *card*. & after bade the man think a *card*? I told him, as was true; that he did first whisper the *Man* in the ear that such a man should think such a *card*: upon this the *Learned* man did much exult, & please himself saying, lo, you may see that my opinion is right: for if the man had thought first, his thought had bin fixed; but the other *Imagining* first, bound his thought: which though it did somewhat sink with me, yet I made

made it lighter than I thought, and said, *It thought it was confederacy between the Jugler, and the two Servants*; though (indeed) I had no reason so to think for they were both my *Fathers* servants, and he had never plaid in the House before. The *Jugler* also did cause a *Garter* to be held up, and took upon him to know that such an *one* should point in such a place of the *Garter*, as it should be near so many *Inches* to the longer end, and so many to the shorter; and still he did it by first telling the *Imaginer*, and after bidding the *Actor* think.

Having told this *Relation*, not for the weight thereof, but because it doth handsomly open the *Nature* of the *Question*, I return to that I said, That *Experiments* of *Imagination* must be practised by others, and not by a *Mans* self. For there be three means to fortifie *Belief*; the first is *Experience*, the second is *Reason*, and the third is *Authority*. And that of these which is far the most potent, is *Authority*: For *Belief* upon *Reason* or *Experience* will stagger.

For *Authority*, it is of two kinds: *Belief* in an *Art*, and *Belief* in a *Man*. And for things of *Belief* in an *Art*, a *Man* may exercise them by himself; but for *Belief* in a *Man*, it must be by another. Therefore if a *Man* believe in *Astrology*, and find a figure prosperous; or believe in *Natural Magick*, and that a *Ring* with such a *Stone*, or such a piece of a *Living Creature* carried, will do good, it may help his *Imagination*; but the *Belief* in a *Man* is far the more active. But howsoever all *Authority* must be out of a *Mans* self, turned (as was said) either upon an *Art*, or upon a *Man*; and where *Authority* is from one *Man* to another, there the second must be *Ignorant*, and not *learned*, or full of thoughts: And such are (for the most part) all *Witches* and *superstitious persons*, whose *Beliefs*, tied to their *Teachers* and *Traditions*, are no whit controlled either by *Reason* or *Experience*: And upon the same reason, in *Magick* they use (for the most part) *Boys* and *Young People*, whose *Spirits* easiliest take *Belief* and *Imagination*.

Now to fortifie *Imagination*, there be three ways: The *Authority* whence the *Belief* is derived; *Means* to quicken and corroborate the *Imagination*; and *Means* to repeat it and refresh it.

For the *Authority* we have already spoken. As for the second, namely, the *Means* to quicken and corroborate the *Imagination*, we see what hath been used in *Magick*; (if there be in those practices any thing that is purely *Natural*) as *Vestments*, *Characters*, *Words*, *Seals*, some parts of *Plants*, or *Living Creatures*, *Stones*, choice of the *Hours*, *Gestures* and *Motions*; also *Incenses* and *Odors*, choice of *Society*, which encreaseth *Imagination*, *Diets*, and *Preparations* for some time before. And for *Words*, there have been ever used, either *barbarous Words* of no sense, lest they should disturb the *Imagination*; or *Words* of *similitude*, that may second and feed the *Imagination*: And this was ever as well in *Heathen Charms*, as in *Charms* of later times. There are used also *Scripture Words*, for that the *Belief* that *Religious Texts* and *Words* have power, may strengthen the *Imagination*. And for the same reason *Hebrew words* (which among us is counted the *holy Tongue*, and the words more *mystical*) are often used.

For the refreshing of the *Imagination* (which was the third *Means* of *Exalting* it) we see the practices of *Magick*; as in *Images* of *Wax*, and the like, that should melt by little and little, or some other things buried in *Muck*, that should putrifie by little and little, or the like: For so oft as the *Imaginant* doth think of those things, so oft doth he represent to his *Imagination*, the effect of that he desireth.

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950.

If there be any power in *Imagination*, it is less credible that it should be so *incorporeal* and *immaterial* a *Virtue*, as to work at great *distances*, or through all *Mediums*, or upon all *Bodies*; but that the *distance* must be competent; the *Medium* not adverse, and the *Body* apt and proportionate. Therefore if there be any operation upon *Bodies* in absence by Nature, it is like to be conveyed from *Man* to *Man*, as *Fame* is: As if a *Witch* by *Imagination* should hurt any a far off, it cannot be naturally, but by working upon the *Spirit* of some that cometh to the *Witch*, and from that party upon the *Imagination* of another, and so upon another till it come to one that hath resort to the party intended; and so by him, to the party intended himself. And although they speak, that it sufficeth to take a *Point*, or a peice of the *Garment*, or the *Name* of the party, or the like; yet there is less credit to be given to those things, except it be by working of evil *Spirits*.

The *Experiments* which may certainly demonstrate the power of *Imagination* upon other *Bodies*, are few or none; for the *Experiments* of *Witchcraft* are no clear proofs, for that they may be by a tacite operation of *malign Spirits*; we shall therefore be forced in this *Inquiry*, to resort to new *Experiments*, wherein we can give onely *Directions* of *Tryals*, and not any *Positive Experiments*. And if any man think that we ought to have staid till we had made *Experiment* of some of them our selves, (as we do commonly in other *Titles*) the truth is, that these *Effects* of *Imagination* upon other *Bodies*, have so little credit with us, as we shall try them at leisure: But in the mean time we will lead others the way.

951.

When you work by the *Imagination* of another, it is necessary that he, by whom you work, have a *precedent opinion* of you, that you can do strange things, or that you are a *Man of Art*, as they call it; for else the simple *affirmation* to another, that this or that shall be, can work but a weak *impression* in his *Imagination*.

952.

It were good, because you cannot discern fully of the *strength* of *Imagination* in one *Man*, more then another, that you did use the *Imagination* of more then one, that so you may light upon a *strange one*. As if a *Physitian* should tell three or four of his *Patients* servants that their *Master* shall surely recover.

953.

The *Imagination* of one that you shall use (such is the variety of *Mens minds*) cannot be always alike *constant* and *strong*; and if the success follow not speedily, it will faint and lose *strength*. To remedy this, you must pretend to him whose *Imagination* you use several *degrees* of *Means* by which to operate: As to prescribe him, that every three days, if he find not the success apparent, he do use another *Root*, or part of a *Beast*, or *Ring*, &c. as being of more *force*; and if that fail, another, and if that, another, till seven times. Also you must prescribe a good large time for the *effect* you promise; as if you should tell a servant of a *sick man*, that his *Master* shall recover, but it will be fourteen days ere he findeth it apparently, &c. All this to entertain the *Imagination*, that it waver less.

954.

It is certain, that *potions* or things taken into the *Body*, *Incenses* and *Perfumes* taken at the *Nostrils*, and *oyntments* of some parts do (naturally) work upon the *Imagination* of him that taketh them. And therefore it must needs greatly cooperate with the *Imagination* of him whom you use, if you prescribe him, before he do use the *Receit* for the Work which he desireth, that he do take such a *Pill*, or a *sposnful* of *Liquor*, or burn such an *Incense*, or anoint his *Temples*, or the *Soles* of his *Feet*, with such an *Oyntment* or *Oyl*; And you must chuse for the *Composition* of such *Pill*, *Perfume*, or *Oynt-*

Oyntment, such *Ingredients* as do make the *Spirits* a little more *gross* or *muddy*, whereby the *Imagination* will fix the better.

The *Body* *passive*, and to be wrought upon, (I mean not of the *Imaginant*) is better wrought upon (as hath ben partly touched) at some times then at others; As if you should prescribe a *Servant* about a *sick person*, (whom you have possessed that his *Master* shall recover) when his *Master* is fast asleep, to use such a *Root*, or such a *Root*. For *Imagination* is like to work better upon *sleeping men*, then *men awake*; as we shall shew when we handle *Dreams*.

We find in the *Art of Memory*, that *Images visible* work better then other conceits: As if you would remember the word *Philosophy*, you shall more surely do it by *imagining* that such a *Man* (for *Men* are best places) is reading upon *Aristotles Physicks*, then if you should imagine him to say, *Ile go study Philosophy*. And therefore this *observation* would be translated to the *subject* we now speak of; for the more lustrous the *Imagination* is, it filleth and fixeth the better. And therefore I conceive, that you shall in that *Experiment* (whereof we spake before) of *binding of thoughts*, less fail, if you tell one that such an one shall name *one of twenty men*, then if it were *one of twenty Cards*. The *Experiment* of *binding of thoughts* would be diversified and tried to the full: And you are to note, whether it hit for the most part, though not always.

It is good to consider upon what *things Imagination* hath most force: And the rule (as I conceive) is, that it hath most force upon *things* that have the *lightest* and *easiest motions*; and therefore above all upon the *Spirits* of *Men*, and in them upon such *affections* as move *lightest*: As upon *procuring* of *Love*, *binding of lust*, which is ever with *Imagination* upon *Men* in *fear*, or *Men* in *irresolution*, and the like: Whatsoever is of this kind would be thoroughly enquired. *Tryals* likewise would be made upon *Plants*, and that diligently: As if you should tell a *man* that such a *Tree* would die this year, and will him at these and these times to go unto it, to see how it thriveth. As for *inanimate things*, it is true, that the *Motion* of *shuffling* of *Cards*, or *casting* of *Dice*, are very *light motions*; and there is a *Folly* very usual, That *Gamesters* imagine, that some that stand by them, bring them ill luck. There would be a *Trial* also made, of holding a *Ring* by a *thread* in a *Glass*, and telling him that holdeth it before, that it shall strike so many times against the *side* of the *Glass*, and no more; or of holding a *Key* between two *mens Fingers* without a *Charm*; and to tell those that hold it, that at such a *Name* it shall go off their *fingers*. For these two are *extream light motions*. And howsoever, I have no *opinion* of these things yet so much I conceive to be true, That *strong Imagination* hath more force, upon *things living*, or that have been *living*, then *things* meerly *inanimate*; and more force likewise upon *light* and *subtil motions*, then upon *motions vehement* or *Ponderous*.

It is an usual *Observation*, That if the *Body* of one *murthered* be brought before the *Murtherer*, the *wounds* will bleed afresh. Some do affirm, That the *dead Body*, upon the presence of the *Murtherer* hath opened the *Eyes*; and that there have been such like *motions* as well where the *party murthered* hath been *strangled* or *drowned*, as where they have been *killed by wounds*. It may be that this participateth of a *Miracle*, by *Gods* just judgement, who usually brings *murthers* to light. But if it be *Natural*, it must be referred to *Imagination*.

The *tying* of the *point* upon the day of *Marriage* to make *Men* im-

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959.

tent towards their *Wives*, which (as we have formerly touched) is so frequent in *Zant* and *Gascony*, if it be *Natural*, must be referred to the *Imagination* of him that tieth the *Point*. I conceive it to have the less affinity with *Witchcraft*, because not peculiar persons onely, (such as *Witches* are) but any *Body* may do it.

960.

Experiment
in Confort,
touching the
Secret Virtue
of Sympathy
and Antipathy.

THere be many things that work upon the *Spirits of Men* by *Secret Sympathy* and *Antipathy*. The *vertues* of *Precious Stones* worn, have been anciently and generally received, and curiously assigned to work several effects. So much is true, that *Stones* have in them fine *Spirits*, as appeareth by their *splendor*: And therefore they may work by *consent* upon the *Spirits of Men*, to comfort and exhilarate them. Those that are the best for that effect, are the *Diamond*, the *Emerald*, the *Jacinth Oriental*, and the *Gold Stone*, which is the *yellow Topaz*. As for their particular *Proprieties*, there is no credit to be given to them. But it is manifest, that *Light* above all things, excelleth in comforting the *Spirits of Men*; and it is very probable, that *Light varied* doth the same effect with more *Novelty*. And this is one of the *causes* why *Precious Stones* comfort. And therefore it were good to have *Tinted Lanthorns*, or *Tinted Skreens* of *Glass* coloured into *Green*, *Blue*, *Carnation*, *Crimson*, *Purple*, &c. and to use them with *Candles* in the *night*. So likewise to have round *Glasses*, not onely of *Glass* coloured through, but with *Colours* laid between *Crystats*, with *handles* to hold in ones hand. *Prismes* are also comfortable things. They have of *Paris* work, *Looking Glasses*, broidered with broad *Borders* of small *Crystal*, and great counterfeit *Precious Stones* of all *Colours*, that are most glorious and pleasant to behold, especially in the *Night*. The *Pictures* of *Indian Feathers* are likewise comfortable and pleasant to behold. So also fair and clear *Pools* do greatly comfort the *Eyes* *Spirits*; especially when the *Sun* is not *glaring* but *overcast*, or when the *Moon* shineth.

961.

There be divers sorts of *Bracelets* fit to comfort the *Spirits*; and they be of three *Intentions*; *Refrigerant*, *Corroborant*, and *Aperient*. For *Refrigerant* I wish them to be of *Pearl*, or of *Coral*, as is used. And it hath been noted that *Coral*, if the party that weareth it be ill disposed, will wax pale; which I believe to be true, because otherwise *distempers* of heat will make *Coral* lose colour. I commend also *Beads* or little *Plates* of *Lapis Lazuli*, and *Beads* of *Nitre*, either alone, or with some *Cordinal mixture*.

962.

For *Corroboration* and *Comfortation*, take such *Babies* as are of *astringent* quality without manifest cold. I commend *Bead-Amber*, which is full of *Astringition*, but yet is *unctuous*, and not cold, and is conceived to impinguate, those that wear such *Beads*. I commend also *Beads* of *Harts-Horn* and *Ivory*, which are of the like nature; also *Orenge Beads*, also *Beads* of *Lignum Aloes*, macerated first in *Rose-water* and dried.

963.

For opening, I commend *Beads*, or peices of the *Roots* of *Cardus Benedictus*; also of the *Roots* of *Peony* the *Male*, and of *Orras*, and of *Calamus Aromaticus*, and of *Rew*.

964.

The *Cramp* (no doubt) cometh of contraction of *Sinews*; which is manifest in that it cometh either by cold or dryness, as after *Consumptions* and long *Agues*; for *Cold* and *Dryness* do (both of them,) contract and corrugate. We see also, that chafing a little above the place in pain, easeth the *Cramp*; which is wrought by the *Delitation* of the contracted *Sinews* by heat. There are in use for the prevention of the *Cramp*, two things: The one, *Rings* of *Sea-horse Teeth* worn upon the *Fingers*; the other, *Bands* of

of *Green Periwinkle* (the *Herb*) tied about the *Calf* of the *Leg*, or the *Thigh*, &c. where the *Cramp* useth to come. I do find this the more strange, because neither of these have any *Relaxing Virtue*, but rather the contrary. I judge therefore that their *working* is rather upon the *Spirits* within the *Nerves* to make them strive less, then upon the *Bodily substance* of the *Nerves*.

I would have *tryal* made of two other *kinds* of *Bracelets* from *comforting* the *Hearts* and *Spirits*. The one of the *Trochisch* of *Vipers* made into little *pieces* of *Beads*; for since they do great good inwards (especially for *Pestilent Agues*) it is like they will be effectual outwards, where they may be applied in greater *quantity*. There would be *Trochischs* likewise made of *Snakes*, whose *flesh* dried is thought to have a very *opening* and *Cordial Virtue*. The other is of *Beads* made of the *Scarlet Powder*, which they call *Kermes*, which is the principal *Ingredient* in their *Cordial Confection Alkermes*. The *Beads* would be made up with *Amber Greece*, and some *Pomander*.

It hath been long received, and confirmed by divers *tryals*, that the *Root* of the *Male Piony* dried, tied to the *Neck*, doth help the *Falling-sickness* and likewise the *Incubus*, which we call the *Mare*. The *cause* of both these *Diseases*, and especially of the *Epilepsie* from the *Stomach*, is the *grossness* of the *Vapors* which rise and enter into the *Cells* of the *Brain*: And therefore the *working* is by *extream* and *subtil Attenuation*, which that *Simple* hath. I judge the like to be in *Castoreum*, *Musk*, *Ren-seed*, *Agnus Castus Seed*, &c.

There is a *Stone* which they call the *Blood-Stone*, which worn, is thought to be good for them that *bleed* at the *Nose*; which (no doubt) is by *striction* and *cooling* of the *Spirits*. *Quare*, if the *Stone* taken out of the *Toads Head*, be not of the like *virtue*, for the *Toad* loveth *Shade* and *coolness*.

Light may be taken from the *Experiment* of the *Horse-tooth Ring*, and the *Garland* of *Periwinkle*, how that those things which allwage the *strife* of the *Spirits* do help *diseases*, contrary to the *Intention* desired; for in the *curing* of the *Cramp*, the *Intention* is to relax the *Sinews*; but the *contraction* of the *Spirits*, that they strive less, is the best help: So to procure easie *Tra-vail* of *Women*, the *Intention* is to bring down the *Child*; but the best help is, to stay the *coming down* too *Fast*; whereunto they say the *Toad-stone* likewise helpeth. So in *Pestilent Fevers*, the *Intention* is to expel the *Infection* by *Sweat* and *Evaporation*; but the best *means* to do it, is by *Nitre* *Diascordium* and other *cool things*, which do for a time arrest the *Expulsion*, till *Nature* can do it more quietly. For as as one saith prettily, *In the quenching of the flame of a Pestilent Ague, Nature is like People that come to quench the Fire of an House; which are so busie, as one of them letteth another*. Surely it is an excellent *Axiome*, and manifold *use*, that whatsoever appeaseth the *contention* of *Spirits* furthereth their *action*.

The *Writers* of *Natural Magick* commend the wearing of the *spoil* of a *Snake*, for *Preserving* of *Health*. I doubt it is but a *conceit*; for that the *Snake* is thought to renew her *Youth* by casting her *spoil*. They might as well take the *Beak* of an *Eagle*, or a piece of a *Harts horn*, because those *renew*.

It hath been anciently received, (for *Pericles* the *Athenian* used it) and it is yet in use, to wear little *Bladders* of *Quick-silver*, or *Tablets* of *Arsenick*, as *preservatives* against the *Plague*: Not, as they conceive, for any *comfort* they yield to the *Spirits*; but for that being *poysons* themselves, they draw the *venome* to them from the *Spirit*.

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970.

971. *Vide the Experiments 95, 96, and 97, touching the several Sympathies and Antipathies for Medicinal use.*
972. It is said, that the *Guts* or *Skin* of a *Wolf*, being applied to the *Belly*, do cure the *Cholick*. It is true, that the *Wolf* is a *Beast* of great *Edacity*, and *Digestion*; and so it may be the *parts* of him comfort the *Bowels*.
973. We see *Scare-crows* are set up to keep *Birds* from *Corn* and *Fruit*. It is reported by some, that the *Head* of a *Wolf*, whole, dried and hanged up in a *Dove-house*, will scare away *Vermin*, such as are *Weasels*, *Polecats*, and the like. It may be the *Head* of a *Dog* will do as much; for those *Vermin* with us, know *Dogs* better than *Wolves*.
974. The *Brains* of some *Creatures*, (when their *Heads* are rosted) taken in *Wine*, are said to strengthen the *Memory*; as the *Brains* of *Hares*, *Brains* of *Hens*, *Brains* of *Deers*, &c. And it seemeth to be incident to the *Brains* of those *Creatures* that are fearful.
975. The *Oyntment* that *Witches* use, is reported to be made of the *Fat* of *Children* digged out of their *Graves*; of the *Juyces* of *Smallage*, *Wolf-bane*, *Cinquefoil*, mingled with the *Meal* of *Fine Wheat*. But, I suppose, that the *Soporiferous Medicines* are likest to do it; which are *Henbane*, *Hemblock*, *Mandrake*, *Moon shade*, *Tobacco*, *Opium*, *Saffron*, *Poplar-leaves*, &c.
976. It is reported by some, that the *affections* of *Beasts* when they are in strength, do add some *virtue* unto *Inanimate things*: As that the *Skin* of a *Sheep* devoured by a *Wolf* moveth *itching*; that a *stone* bitten by a *Dog* in anger, being thrown at him, drunk in *Powder* provoketh *Choler*.
977. It hath been observed, that the *diet* of *Women* with *Child*, doth work much upon the *Infant*. As if the *Mother* eat *Quinces* much, and *Coriander-seed* (the *nature* of both which, is to repress and stay *vapors* that ascend to the *Brain*) it will make the *Child* ingenious: And on the contrary side, if the *Mother* eat (much) *Onions* or *Beans*, or such *vaporous food*, or drink *Wine* or *strong Drink* immoderately, or *Fast* much, or be given to much *musing*, (all which send or draw *vapors* to the *Head*) it endangereth the *Child* to become *Lunatick*, or of *imperfect memory*: And I make the same judgment of *Tobacco* often taken by the *Mother*.
978. The *Writers* of *Natural Magick* report, that the *Heart* of an *Ape* worn near the *Heart*, comforteth the *Heart*, and increaseth *audacity*. It is true, that the *Ape* is a merry and bold *Beast*. And that the same *Heart* likewise of an *Ape* applied to the *Neck* or *Head*, helpeth the *Wit*, and is good for the *Falling sickness*. The *Ape* also is a witty *Beast*, and hath a *dry Brain*; which may be some *cause* of *attenuation* of *Vapors* in the *Head*. Yet it is said to move *Dreams* also. It may be the *Heart* of a *Man* would do more, but that it is more against *Mens* minds to use it; except it be in such as wear the *Reliques* of *Saints*.
979. The *Flesh* of a *Hedgehog* dressed and eaten, is said to be a great *drier*. It is true, that the *Juice* of a *Hedgehog*, must needs be *Harsh* and *Dry*, because it putteth forth so many *Prickles*: For *Plants* also that are full of *Prickles*, are generally *dry*; as *Briars*, *Thorns*, *Barberries*. And therefore the *Ashes* of a *Hedgehog* are said to be a great *Desiccative* of *Fistula's*.
980. *Mummy* hath great force in *Stanching* of *bloud*; which as it may be ascribed to the *Mixture* of *Balmes*, that are *Glutinous*; so it may also partake of a secret *Propriety*, in that the *bloud* draweth *Mans Flesh*. And it is approved, that the *Moss* which groweth upon the *Scull* of a *Dead Man* unburied will stanch *bloud* potently. And so do the *dregs* or *Powder* of *bloud* severed from the *Water* and *dried*.

It hath been practised to make *White Swallows*, by *anointing* of the *Eggs* with *Oyl*. Which *effect* may be produced by the *stopping* of the *Pores* of the *shell*, and making the *Juice* that putteth forth the *Feathers* afterwards more penurious, and it may be, the *anointing* of the *Eggs* will be as effectual as the *anointing* of the *Body*. Of which, *Vide the Experiment 93.*

981.

It is reported, that the *White* of an *Egg*, or *Blood* mingled with *Salt-water*, doth gather the *Saltiness*, and maketh the *water* sweeter. This may be by *Adhesion*; as in the *Sixth Experiment* of *Clarification*. It may be also, that *Blood*, and the *White* of an *Egg*, (which is the *matter* of a *Living Creature*) have some *Sympathy* with *Salt*; for all *Life*, hath a *Sympathy* with *Salt*. We see that *Salt* laid to a *cut finger*, healeth it; so, as it seemeth, *Salt* draweth *Blood*, as well as *Blood* draweth *Salt*.

982.

It hath been anciently received, that the *Sea-Hare* hath an *Antipathy* with the *Lungs*, (if it cometh near the *Body*) and erodeth them. Whereof the *cause* is conceived to be a *quality* it hath of *heating the Breath* and *Spirits*; as *Cantharides* have upon the *watry parts* of the *Body*, as *Urine* and *Hydropical Water*. And it is a good rule, That whatsoever hath an *operation* upon certain *kinds* of *Matters*, that in *Mans Body* worketh most upon those *parts* wherein that kind of *matter* aboundeth.

983.

Generally that which is *Dead*, or *Corrupted*, or *Excerned*, hath *antipathy* with the same *thing* when it is *alive*, and when it is *sound*, and with those *parts* which do *excern*: as a *Carcase* of *Man* is most *infectious* and *odious* to *Man*, a *Carrian* of an *Horse* to an *Horse*, &c. *Purulent matter* of *Wounds* and *Ulcers*, *Carbuncles*, *Pox*, *Scabs*, *Leprosie*, to *sound Flesh*; and the *Excrement* of every *Species* to that *Creature* that *excerneth* them. But the *Excrements* are less pernicious than the *corruptions*.

984.

It is a common experience, That *Dogs* know the *Dog-killer*, when as in times of *Infection* some petty *Fellow* is sent out to kill the *Dogs*; and that though they have never seen him before, yet they will all come forth, and bark, and fly at him.

985.

The *Relations* touching the *Force* of *Imagination*, and the *Secret instincts* of *Nature*, are so uncertain, as they require a great deal of *Examination* ere we conclude upon them. I would have it first thoroughly inquired, whether there be any secret passages of *Sympathy* between *Persons* of *near blood*; as *Parents*, *Children*, *Brothers*, *Sisters*, *Nurse-children*, *Husbands*, *Wives*, &c. There be many reports in *History*, that upon the *death* of *Persons* of such nearness, *Men* have had an inward feeling of it. I my self remember, that being in *Paris*, and my *Father* dying in *London*, two or three days before my *Fathers* death, I had a *dream*, which I told to divers *English Gentlemen*, that my *Fathers House* in the *Country* was *Plaistered* all over with *Black Mortar*. There is an opinion abroad, (whether idle, or no I cannot say) That loving and kind *Husbands* have a *sense* of their *Wives breeding Child* by some accident in their own *Body*.

986.

Next to those that are *near in blood*, there may be the like passage and *instincts* of *Nature* between great *Friends* and *Enemies*. And sometimes the revealing is unto another *person*, and not to the *party* himself. I remember *Philippus Comineus* (a grave *Writer*) reporteth, That the *Arch-bishop* of *Vienna* (a *Reverend Prelat*) said (one day) after *Mass* to *King Lewis* the *Eleventh* of *France*, Sir, Your *Mortal Enemy* is dead; what time *Duke Charles* of *Burgundy* was slain at the *Battel* of *Granson* against the *Switzers*. Some tryal also would be made, whether *Pact* or *Agreement* do any thing; as if two *Friends* should agree, That such a day in every *Week*, they being in far distant places should pray

987.

Pray one for another; or should put on a *Ring* or *Tablet*, one for another's sake; whether if one of them should break their *Vow* and *Promise*, the other should have any *Feeling* of it, in *Absence*.

988.

If there be any *Force* in *Imaginations* and *Affections* of *Singular Persons*; It is Probable the *Force* is much more in the *Joynt Imaginations* and *Affections* of *Multitudes*: as if a *Victory* should be won, or lost in *Remote Parts*, whether is there not some *Sense* thereof, in the *People* whom it concerneth; because of the great *Joy*, or *Grief*, that many *Men*, are possessed with at once? *Pius Quintus*, at the very time, when that Memorable *Victory* was won, by the *Christians*, against the *Turks*, at the *Naval Battel* of *Lepanto* being then hearing of *causes* in *Consistory*, brake off suddenly, and said to those about him: *It is now more time, we should give thanks to God, for the great Victory he hath granted us, against the Turks*. It is true, that *Victory* had a *Sympathy* with his *Spirit*; for it was meerly his work, to conclude that *League*. It may be, that *Revelation* was *divine*; but what shall we say then, to a number of *examples*, amongst the *Grecians*, and *Romans*? where the *people* being in *Theaters* at *Plays*, have had news of *victories* and *overthrows* some few days, before any *Messenger* could come.

It is true, that that may hold in these things, which is the general *Root* of *Superstition*: namely, that *Men* observe when *things* *Hit*, and not when they *miss*: and commit to memory the one, and forget and pass over the other. But touching *Divination*, and the *misgiving* of *minds*, we shall speak more, when we handle in general, the *nature* of *minds*, and *Souls*, and *Spirits*.

989.

We have given formerly some *Rules* of *Imagination*; and touching the *fortifying* of the Same. We have set down also some few *instances*, and *directions*, of the *force* of the *Imagination*, upon *Beasts*, *Birds*, &c. upon *plants*, and upon *Inanimate bodies*: wherein you must still observe, that your *tryals* be upon *subtil* and *light motions*, and not the contrary; for you will sooner by *Imagination*, bind a *Bird* from *singing*, than from *eating* or *flying*: and I leave it to every *Man*, to choose *Experiments*, which himself thinketh most commodious; giving now but a few *examples* of every of the three kinds.

990.

Use some *Imaginant*, (observing the *Rules* formerly prescribed) for *binding* of a *Bird* from *singing*; and the like of a *dog* from *barking*. Try also the *Imagination* of some, whom you shall accommodate with things to fortifie it in *Cock fights*, to make one *Cock* more hardy, and the other more cowardly. It would be tried also in *flying* of *Hawks*; or in *coursing* of a *Deer* or *Hare*, with *Grey-hounds*; or in *Horse-Races*; and the like *comparative Motions*: for you may sooner by *Imagination* quicken or slack a *Motion*, than raise or cease it, as it is easier to make a *dog* go slower, than to make him stand still that he may not run.

991.

In *Plants* also you may try the *force* of *Imagination*, upon the *lighter* sort of *Motions*: as upon the sudden *Fading* or lively *coming up* of *Herbs*; or upon their *bending* one way or other; or upon their *Closing* and *Opening*, &c.

992.

For *Inanimate things*, you may try the *force* of *Imagination*, upon staying the *working* of *beer* when the *Barm* is put in; or upon the *coming* of *butter* or *cheese* after the *Charming*, or the *Rennet* be put in.

993.

It is an ancient *Tradition* every where alledged, for *example* of *secret proprieties* and *influxes* that the *Torpedo Marina*, if it be touched with a long stick, doth stupifie the *hand* of him that toucheth it. It is one degree of

work.

working at distance, to work by the continuance of a fit Medium; as Sound will be conveyed to the Ear by striking upon a Bow-string, if the Horn of the Bow be held to the Ear.

The Writers of Natural Magick do attribute much to the Vertues that come from the parts of Living Creatures, so as they be taken from them, the Creatures remaining still alive; as if the Creature still living did infuse some immateriate Vertue and vigor into the part severed. So much may be true, that any part taken from a Living Creature newly slain, may be of greater force, then if it were taken from the like Creature dying of itself; because it is fuller of Spirit.

Tryal would be made of the like parts of Individuals in Plants and Living Creatures; as to cut off a Stock of a Tree, and to lay that which you cut off to putrefie, to see whether it will decay the rest of the Stock; or if you should cut off part of the Tail, or Leg of a Dog, or a Cat, and lay it to putrefie, and so see whether it will fester, or keep from healing, the part which remaineth.

It is received, that it helpeth to continue love, if one wear a Ring or a Bracelet of the Hair of the party beloved. But that may be by the exciting of the Imagination; and perhaps a Glove, or other like Favor, may as well do it.

The Sympathy of individuals that have been Intire, or have Touched, is of all others, the most Incredible: yet according unto our faithful manner of Examination of Nature, we will make some little mention of it. The taking away of Warts, by Rubbing them with somewhat that afterwards is put to waste and consume, is a common Experiment; and I do apprehend it the rather, because of mine own Experience. I had from my Childhood, a Wart upon one of my Fingers, afterwards, when I was about sixteen years old, being then at Paris, there grew upon both my Hands a number of Warts (at least on hundred) in a moneths space. The English Embassadors Lady, who was a Woman far from Superstition, told me one day she would help me away with my Warts. Whereupon she got a Piece of Lard with the Skin on, and rubbed the Warts all over with the Fat side, and amongst the rest that Wart which I had had from my Childhood; then she nailed the piece of Lard with the Fat towards the Sun, upon a Post of her Chamber Window, which was to the South. The success was, that within five weeks space all the Warts went quite away, and that Wart which I had so long endured for company. But at the rest I did little marvel, because they came in a short time, and might go away in a short time again; but the going away of that which had staid so long doth yet stick with me. They say the like is done by the rubbing of warts with a green Elder-stick, and then Burying the Stick to Rot in Muck. It would be tried with Cornes, and Wens, and such other Excrescences: I would have it also tried with some Parts, of Living Creatures that are nearest the Nature of Excrescences, as the Combs of Cocks, the Spurs of Cocks, the Horns of Beasts, &c. and I would have it tried both ways: both by rubbing those parts with Lard or Elder as before, and by cutting off some peice of those parts and laying it to Consume, to see whether it will work any effect towards the Consumption of that part which was once joyned with it.

It is constantly received and avouched, that the anointing of the Weapon that maketh the Wound, will heal the Wound it self. In this Experiment, upon the relation of men of credit, (though my self, as yet, am not fully inclined to believe it) you shall note the Points following. First, the Oyntment wherewith this is done, is made of divers Ingredients; whereof the

994.

995.

996.

997.

998.

It range-

strangest and hardest to come by, are the *Moss* upon the *Skull* of a *dead-man* *unburied*, and the *Fats* of a *Boar*, and a *Bear* killed in the *act* of *generation*. These two last I could easily suspect to be prescribed as a *startling* hole, that if the *Experiment* proved not, it might be pretended, that the *Beasts* were not killed in the due time; for as for the *Moss*, it is certain there is great quantity of it in *Ireland*, upon *slain Bodies* laid on *heaps* *unburied*. The other *Ingredients* are the *Blood-stone* in *Powder*, and some other *things*, which seem to have a *virtue* to *stanch* *blood*, as also the *Moss* hath. And the *Description* of the *Whole Oyntment* is to be found in the *Chymical Dispensatory* of *Crollius*. Secondly, The same *Kind* of *Oyntment* applied to the *Hurt* it self, worketh not the *effect*, but onely applied to the *Weapon*. Thirdly, (which I like well) they do not observe the *Confecting* of the *Oyntment* under any certain *Constellation*; which commonly is the excuse of *Magical Medicines* when they fail, that they were not made under a fit *figure* of *Heaven*. Fourthly, it may be applied to the *Weapon*, though the *party hurt* be at great *distance*. Fifthly, it seemeth the *Imagination* of the *party* to be *cured* is not needful to concur, for it may be done without the knowledge of the *party Wounded*: And thus much hath been tried; that the *Oyntment* (for *Experiments* sake) hath been wiped off the *Weapon*, without the knowlege of the *party hurt*, and presently the *party hurt* hath been in great *rage* of *pain*, till the *Weapon* was *reanointed*. Sixthly, it is affirmed; That if you cannot get the *Weapon*, yet if you put an *Instrument* of *Iron* or *Wood*, resembling the *Weapon* into the *Wound*, whereby it bleedeth, the *anointing* of that *Instrument* will serve and work the *effect*. This I doubt should be a device to keep this strange *form* of *Cure* in request and use, because many times you cannot come by the *Weapon* it self. Seventhly, the *Wound* must be at first *Washed* *clean* with *White-wine*, or the *parties* one *Water*, and then bound up close in *fine Linnen*, and no more *dressings* renewed till it be *whole*. Eighthly, the *Sword* it self must be *wrapped* up close as far as the *Oyntment* goeth, that it taketh no *mind*. Ninthly, the *Oyntment*, if you *wipe* it off from the *Sword* and keep it, will *serve* again, and rather *increase* in *vertue* then *diminish*. Tenthly, it will *cure* in far *shorter time*, then *Oyntments* of *Wounds* commonly do. Lastly, it will *cure* a *Beast* as well as a *Man*; which I like best of all the rest, because it subjecteth the *matter* to an *easie tryal*.

999.
Experiment
Solitary,
touching
Secret Propri-
eties.

I Would have Men know, that though I reprehend the *easie* passing over of the *causes* of *things*, by ascribing them to *secret* and *hidden* *virtues* and *proprieties* (for this hath arrested and laid asleep all true *Inquiry* and *Indications*;) yet I do not understand, but that in the *practical* part of *Knowledge* much will be left to *Experience* and *Probation*, whereunto *Indigation* cannot so fully reach; and this not onely in *Species* but in *Individuo*. So in *Physick*, if you will cure the *Jaundies*, it is not enough to say, that the *Medicine* must not be *cooling*, for that will hinder the *opening* which the *disease* requireth; that it must not be *Hot*, for that will exasperate *Cholor*; that it must go to the *Gall*, for there is the *obstruction* which causeth the *disease*, &c. But you must receive from *Experience*, that *Powder* of *Chamæpytis*, or the like, drunk in *Beer*, is good for the *Jaundies*. So again, a wise *Physitian* doth not continue still the same *Medicine* to a *Patient*, but he will vary, if the first *Medicine* do not apparently succeed; for of those *Remedies* that are good for the *Jaundies*, *Stone*, *Agues*, &c. that will do good in one *Iodie*, which will not do good in another, according to the correspondence the *Medicine* hath to the *Individual Body*.

1000.

Experiment
Solitary,
touching the
General Sym-
paty of Mens
spirits.

THe *delight* which *Men* have in *Popularity*, *Fame*, *Honor*, *Submission* and *Subjection* of other *Mens Minds*, *Wills*, or *Affections* (although these *things* may be desired for other *ends*) seemeth to be a *thing* in it self, without contemplation of consequence, grateful, and agreeable to the *Nature* of *Man*. This thing (surely) is not without some signification, as if all *Spirits* and *Souls* of *Men* came forth out of one *Divine Limbus*; else, why should *Men* be so much affected with that which others think or say? The best temper of *Minds*, desireth good *Name* and true *Honor*; the lighter *Popularity* and *Applause*; the more depraved, *Subjection* and *Tyranny*; as is seen in great *Conquerors* and *Troublers* of the *World*, and yet more in *Arch-Hereticks*, for the introducing of new *Doctrines*, is likewise an *affection* of *Tyranny* over the *Understandings* and *Beliefs* of *Men*.

A

A T A B L E

Of the chief Matters contained in these

CENTURIES.

A.

Acceleration of time in Works of nature, 67. In Clarification of Liquors, 68. In several Maturation, 69. As of Fruits, *ibid.* Of Drinks, *ibid.* Imposthumes and Ulcers, *ibid.* Of Metals, *ibid.* Of Clarification in Wine, 165. Acceleration of Putrefaction, 73. Acceleration of Birth, 78. Of Growth or Stature, *ibid.* Three means of it *ibid.* Acceleration of Germination, 89. By three means, *viz.* Mending the Nourishment, 90. Comforting the Spirits of the Plant, *ibid.* Ease coming to the Nourishment, 91. Several instances thereof 89, 90, 91. Acres in Mens Bodies foreshew rain, 176. Egypt scarce hath any rain, 161. Egyptian conserving of Bodies, 163. Their Mummies *ibid.* Equinoctial more tolerable for heat, than the Zones, 87. Three causes thereof, *ibid.* Ethiopes 87. Etna 165. Affection of Tyranny over Mens understandings and beliefs 213. Affections of Beasts impressed upon inanimate things 214. Agarick 116, 131. Air turned into water, 6. By four several ways, *ibid.* Instances tending thereto, 20, 21. Converted into a dense body, a rarity in nature, 7. Hath an antipathy with tangible bodies, 21. Converted into water by repercussion from hard bodies, *ibid.* Air turned into water by the same means that Ice, *ibid.* Congealing of Air, 80. Air condensed in weight 156.

Air pent the cause of Sounds, 32, 33, 34. Eruptions thereof, cause Sounds, *ibid.* Air not always necessary to Sounds 36.

Air excluded in some Bodies, prohibiteth putrefaction, 75. In some causeth it, 76. The causes of each, *ibid.* Air compressed and blown, prohibiteth putrefaction 77.

Airs wholesome, how found out, 164. The putrefaction of Air, to be discerned aforesaid, 173. Airs good to recover Consumptions, 204. Air healthful within doors, how procured *ibid.*

Air and Fire, foreshew winds 274. Air, 21. The causes of heat, and cold in it, *ibid.* Hath some degree of light in it, *ibid.*

Air poisoned by art 202. Alchymists 71.

Alexanders Body preserved till Cæsars time, 163.

Aliments changed good 18.

Alleys close gravelled, what they bring forth 117.

All Night 93.

Almond Butter for nourishing sick bodies better than Callices 13.

Alterations of bodies 179.

Altering the colours of Hairs and Feathers 183.

Amber smell 203.

Anger, 150. The impression thereof, 151. Causeth the eyes to look red, 189. The cause *ibid.*

Animate and inanimate, wherein they differ, 125.

Annihilation, not possible in Nature 28.

Anointing of the Weapon 213.

Annual Herbs 120.

Antonius his genius weak before Augustus, 204.

Antipathy and Sympathy, 25. Of Plants, 101, 102, 103, 104, 105. Instances of

Antipathy in other kinds, 209, 210, 211, 212, 213. Antipathy between enemies in absence	ibid
Appetite of continuation in Liquid bodies	5, 6
Appetite in the stomach, 176. What qualities provoke it, ibid. Four causes thereof, ibid.	ibid.
Apple inclosed in Wax for speedy ripening, 70, 71. Hunged in smok, ibid. Covered in Lime and Ashes, ibid. Covered with Crabs and Onions, ibid. Apple in Hay and Straw, ibid. In a close box, ibid. Apple rolled, ibid. Apple in part cut, besmeared with sack	ibid.
Apple-cions grafted on the stock of a Colewort	97
Apple-trees, some of them bring forth a sweet M. fr.	114
Aqua fortis dissolving Iron	160
Archbishop of Vienna his revelation to Lewis the elevenib	211
Arrows with wooden heads sharpened, pierce wood sooner, then with Iron heads	148
Artichokes made less prickly	98
Art of memory	27
Ashes in a vessel, will not admit equal quantity of water, as in the vessel empty	10
Ashes an excellent compst	123
Ass causeth easie death	132
Assimilation in bodies inanimate, 24. In vegetables	ib. 79, 179
Astriction prohibiteth putrefaction	75
Attraction by similitude of substance	149, 191.
Audibles mingle in the medium, which visibles do not, 53. The cause thereof, ibid. Several Consents of audibles and visibles, 58, 59. Several Dissents of them, 60, 61. Audibles and Visibles	204
Authority strengthneth Imagination	206
B.	
Bag growing in the fields	115
Barrel empty knocked said to give a Dipsion to the same Barrel full	45
Barrenness of Trees, the cause	100
Basil turned into Wild Thyme	111
Basilisk	202
Bathing the body, 156. Would not be bealithful for us, if it were in use, ibid. For the Turks good	ib
Bearing in the womb, in some creatures longer, in some shorter	159
Beasts do not imitate Mans speech as Birds do, 55. The cause, ibid. Beasts communicating in species with one another, 138. Likewise some Birds, ibid. Beasts in their	ibid.
kinds, lesser then Fishes, 284. Greater then Birds, the cause	ibid.
Beasts that yeild the taste or virtue of the Herb they feed on	104
Beasts foreshew Rain	175
Capon Beer, how made, 13. A very nourishing drink	ibid.
Bees humming an unequal sound	43
Birds have another manner in their quickning, then Men or Beasts, 25. Birds communicating in species with one another, 138. Swifter in motion then Beasts, ibid. The cause, ibid. In their kinds, lesser then Beasts or Fishes, 184. The cause ibid. Imitate Mans speech, which Beasts do not, 55. The cause	ibid.
Birth of Living creatures	78
Black the best colour in Plumbs	109
Blar eyes infectious	202
Bleeding of the body, at the approach of the murderer	207
Blood, five means of stanching it	118
Blood draweth salt	211
Blood of the Cuttle fish	156
Blood stone	210
Blows and bruises induce swelling, 187. The cause	ibid.
Blushing causeth redness in the ears, not in the eyes, as anger doth, 189. The cause of each	ibid.
Boring a hole through a Tree, helpeth it	94
Body brittle stricken, 3. Bodies natural most of them have an appetite of admitting others into them, 169. Except flame, ibid. Bodies imperfectly mixt	178
Bodies in nature that give no sounds, and that give sounds	32, 33, 34
Bodies, to which, Wine is hurtful, and to which, good	153
Bodies conserved a long time	162, 163
Boldness and industry, the power of them in civil business	192, 203
Boletus	131
Bolus Armenus	147
Bones, 141, 157. The most sensible of cold, 141. In what Fishes none, 157. One in the Heart of a Stag	ib.
Boiling causeth Grains to swell in difference	185
Bracelets worn which comfort the spirits, 219. Their three several operations,	ibid.
Brains, of some Beasts strengthen the memory	210
Brain increased in the Full Moon	194
Brass sanitive of wounds	166
Brass plates assuage swelling	187
Breath held, helpeth bearing, 61. The cause	ibid.
Bryer	

Bryr-bath 117
Bringing forth many at a Birth, and but one
 160. The cause of each *ibid.*
Burning glasses rare 34
Burning some Vegetables upon the ground,
enricheth it 122
Borage-leaf infused 4

C.

Cake growing on the side of a dead Tree 139
Calamitas 137
 andles of several mixtures, 82. Of several
 wicks, 83. Laid in Bran for lasting, *ibid.*
Cantharides, wheresoever applied, affect the
Bladder, 25, 211. The Flies Cantha-
rides, 153. Of what substance they are
bred *ibid.*
Carrying of foreign Roots safe 128
Cassia *ibid.*
Casting of the skin or shell, 154. The crea-
tures that cast either *ibid.*
Caterpillars 153
Cements that grow hard 183
Chaik, a good compost, 122, 123. Good for
Pasture, as well as for Arable *ibid.*
Chameleons, 80. Their nourishment, ibid.
A fond Tradition of them *ibid.*
Chameleoned Paper 156
Change in Medicines and Aliments good,
 18. The cause why *ibid.*
Charcoal vapor in a close room, mortal 202
Charm 205
Cheap fuel 164
Children born in the seventh month, vital,
in the eighth, not, 78. The cause why
ibid. Over-much nourishment, ill for
 children, *ibid.* Dry nourishment not, hurt-
 ful, *ibid.* Nourishment of an opening
 nature good for them, *ibid.* Sitting much,
 hurtful for them, *ibid.* Cold things,
 hurtful, *ibid.* Long sucking, hurtful,
ibid.

Chinifer 71
Cions over-rule the Stock, 93. Must be supe-
rior to it, 99. Cions regrafted. 97
Cinnamon, 128. The Properties of that
Tree *ibid.*
Citron grafted on a Quince 110
Clammy Bodies 64, 65
Clarifying of Liquors by Adhesion, 2. Of
water running *ibid.*
Clarification of Liquors, 67. Three causes
thereof, ibid. 80. Clarification of them
by Separation, ibid. By even distribution
of the Spirits, ibid. By Refining the Spi-
rit, ibid. Several instances of Clarifica-
tion, ibid. 68. Clarification of Drinks,

ibid. 69. Of Wine 137
Clarification 162
Cloves, attractive of Water 21
Casting of Plants 97
Coffee, a Berry making Drink in Turkey
 155
Cold, 19. Production of it, a very noble
work, ibid. Seven means to produce it,
ibid. 20. Primum Frigidum, the Earib,
 19. Transitive into Bodies adjacent, as
 well as Heat, *ibid.* All tangible Bodies
 of themselves, cold, *ibid.* Density, cause
 of cold, *ibid.* Quick spirit in a cold body
 increaseth cold, *ibid.* 20. Chasing away
 of the warm spirits, increase of cold, *ibid.*
 Exhaling of the warm spirits, doth the
 like, *ibid.* Cold prohibiteth Putrefaction,
 75. Irriteth Flame 83
Cold having mortified any part, how to help
it 166
Coleworts furthered in their growth by Sea-
weed, 93. By being watered with Salt-
water, 93. Hurt neighbor Plants 101
Cholick cured by application of Wolfs-guts
 210
Colliquation 73
Coloquintida 202
Coloration of Flowers, 108. Colours of
Flowers different from the same Seed,
 109, Colours of Herbs *ibid.*
Colours vanish not by degrees as Sounds do
 51. The causes thereof, *ibid.* Colours of
 Metal Orient in their dissolutions, 64.
 The causes *ibid.*
Comforting of the Spirits of Men by several
things 209
Composts to enrich ground, 122, 123, 124.
The ordering of them for several grounds,
 222. Six kinds of them *ibid.*
Compound fruits, 100. How they may be
made *ibid.*
Compression in solid Bodies, 2. Cause of all
violent motion 3. Not hitherto required,
ibid. Worketh first in round, then in pro-
 gress, *ibid.* Easily discernable in Liquors,
 in solid bodies not, *ibid.* Compression in a
 brittle body, *ibid.* In powder, in shot,
ibid. To a preternatural extent, 16. In
 Sounds, *ibid.* Compression of Liquors 187
Concoction, 179. The word less restrained
then formerly, ibid. Not the work of
Heat alone, ibid. The two periods of it
ibid.
Concords in Musick 30
Concretion of Bodies, 181. Dissolved by the
contrary *ibid.*
Condensing Medicines to relieve the Spirits
 155
Condensing of Air into weight 156
 V 2 Con-

A Table of the chief Matters

Congeaing of Air	80	Diapason or number of Eight, rather a thing received, then a true computation	ibid.
Conservation of Bodies long time, 162, 163.	ibid.	ibid. Half Notes of Necessity between the Unison and Diapason	ibid.
The causes and helps thereof	168	Diet drinks, 19. Most troublesome at first	ibid.
Conservation of Bodies in Quick-silver	180	Differences of Plants	121, 122
Consistence of Bodies	204	Differences of several passions in matter	182
Consumptions in what Airs recovered	201	Digging of Earth healthful	203
Contiguous things, their operations	93	Discords in Musick	30, 31
Coppice-woods hastned	126, 165	Diseases contrary to predisposition, 17. What the Physitian is to do in such cases, ibid.	
Coral	110	Diseases infectious, 65. Diseases epidemical	8
No Care in Fruits	110	Displeasures and pleasures of the senses	145
Corn changed by sowing often in the same ground, 111. Changed into a baser kind by the sterility of the year, ibid. The Diseases thereof, 136. The remedy of the Diseases, ibid. 137. Choice of the best Corn	ibid.	Displeasure light, 161. The impressions thereof	ibid.
Corruptions	73	Dissolution of Iron in Aqua fortis	166
Court of Vulcan near Puteoli	165	Divination Natural	172
Crampt, 211, 212. Two cures of it	ibid.	Dogs know the Dog killer	211
Creatures moving after the severing of the head	ibid.	Double Flowers	109, 110
88. The causes thereof	179	Down upon the leaves of Plants, 117. The virtue of such leaves	ibid.
Crudity	179	Dreams pleasant and propheticall procured by some smells	204
Crystal in Caves, 81. Designation of a tryal for making of it	ibid.	Drink, 69. The maturation of them, ibid. How it is wrought, ibid. Wherein it differeth from clarification, ibid. Degrees of Maturation in several Liquors, ibid. Maturation by inforcing the motions of the Spiritus, ibid. Quickning of drink that is dead	ibid.
Cucumbers made to grow sooner, 96. To bear two years, ibid. By steeping their Seed in Milk, prove more dainty, 98. Made more delicate by throwing in chaff when they are set, ibid. They exceedingly affect moisture, ibid. Will grow towards a pot of water.	ibid.	Drowning of Metals	168, 159
Cure by custom, 17. Caution to be used in diseases counted incurable, ibid. Cure by excess, ibid. The cause of it, ibid. Cure by motion of consent, ibid. Physitians, how to make use of this motion	ibid.	Drunken men, 152. Their Sperm unfruitful, 153. They are unapt for voluntary motion, ibid. Imagine false things as to the eye, ibid. Distempered sooner with small draughtes, then with great	ibid.
Curiosities touching Plants, 107, 108, 109, 110	110	Drying the adventitious moisture, prohibiteth putrefaction, 76. Mixture of dry things prohibits it	ibid.
Curled leaves in Plants	133	Ductible bodies	181, 182
Cutting Trees often, causeth their long lasting	120	Dulcoration of things, 137. Of Metals	
Cuticles blood	156	79. Of Fruits by several ways, 186. The causes of them	ibid.
D.			
Damps from Mines and Minerals	202	Dungs of Beasts to enrich grounds	122
Day showers, not so good for Fruits as night-showers	135	Which of them the best.	ibid.
Death without pain	232	Dust maketh Trees fruitful	136
Decoction maketh Liquors clearer, Infusion thicker, 68. The cause	ibid.	Dwarfing of Trees	113
Deer, 159. Their generating	ibid.	E.	
Degenerating of Plants, 110, 111. The several causes thereof	ibid.	Ear dangerous to be picked in yawning	140
Democritus	203	Early Flowers and Plants	119
Desiccation	74	Earth and Sand differ, 1. Earth Primum Frigidum, 19. Infusions in Earth, 83. The effects thereof, ibid. Cautions to be used therein, ibid. Several instances thereof, ibid.	
Dew upon Hills better then upon Valleys	165		
Diamonds Cornish	2		
Diapason, the sweetest of Sounds, 30. The			

ibid. Earth taken out of the Vaults will put forth Herbs, 117. The nature of these Herbs, ibid. What Earth taken out of shady and watry woods will put forth, ibid. Earth upon Earth, a good Compost, 123. Earths good and bad 136. Earths Medicinal, 147. Earth taken near the River Nilus, 156. Earth pure, the healthfullest smell of all 203
 Ebbing and Flowing of the Sea 200
 Echoes, 56. Artificial Echoes not known, ibid. Natural Echoes where found, ibid. The differences between the Concurrent Echo and Iterant, ibid. No Echo from a Trunk, stopped at one end, ibid. The cause, ibid. Echo from within a Well, ibid. Whether Echoes move in the same angle with the original Sounds, ibid. Plurality of Echoes in one place, ibid. Back Echoes, ibid. Echoes returning many words, 58. Echo upon Echo, 167, 168. The like betwixt an House, and an Hill, 8. Echo will not return the Letter S, ibid. Difference of Echoes, ibid. Mixture of Echoes ibid.
 Edible flesh, and not Edible, 186. The causes of each ibid.
 Eggs the yoke of them great nourishers, 14. How to be used, ibid. Yolk conduceth more to the nourishment. White to the generation of the Bird 25
 Eight the sweetest Concord in Musick 30
 Elder stick put to consume, taketh away warts 213
 Electrum 168
 Electric Bodies ibid.
 Elm grafted 100
 Enforcing a thought upon another, 204. Instance thereof, in a Juglers trick, ibid. Three means by which it must be wrought 204, 205
 Englishman hurt in the Leg, hard to cure 166
 Envy 203, 204
 Epidemical Diseases 85
 Esculent Plants, 129. Esculent raw, ibid. Having passed the fire, ibid. Not Esculent at all ibid.
 Eunuchs 142
 Excrements of living creatures smell ill, 177 The cause, 178. Some smell well, ibid. The cause ibid. Most odious to a creature of the same kind
 Excrements of Plants, 113, 114, &c. Two tryals for Excrements, 116. Excrements joyned with Putrefaction 117
 Exercise, 66. In what Bodies hurtful, ibid. Not to be used with a spare diet, ibid. Benefits of exercise, ibid. Evils of exer-

cise, ibid. Exercise impingeth not so much as friction, 190. The cause ibid.
 Eye of the Understanding, like the Eye of Sense 24
 The Eyes, 188. Both move one way, ibid. See better one Eye shut, ibid. The cause, ibid. why some see one thing double, ibid. Pore-blind men see best near hand, ibid. The cause, ibid. Old men at some distance ibid.
 Eyes are offended by over-great Lights, 189. By interchange of Light and Darkness on the sudden, ibid. By small Prints, ibid. wax red in Anger, in Blushing not, ibid. The cause of each, ibid. Eye replaced, hath recovered sight 88

F.

Fable of Hercules and Hylas 40
 Falling sickness, how helped 210
 Fascination 203
 Fat extracted out of flesh 139
 Fear, 149, 206. The impressions thereof 149, 150
 Feathers of Birds, why of such fine colours, 2. How the colour of them may be changed 24, 25. Age changeth them 183
 Feathers burnt suppress the Mother 204
 Female and Male in Plants, 126. The differences of Female and Males in several living Creatures, 184. The causes thereof ibid.
 Fetid smells 177, 178
 Fibrous Bodies 181, 182
 Figs in the spring, 96. Indian Fig 127
 Figurable, and not Figurable 182
 Figures of Plants 121
 Figures or Tropes in Musick, have an agreement with the Figures of Rhetorick 31
 Fire tanneth not as the Sun doth 87, 88
 Fire and hot water, heat differently, 140. Fires subterranny 80
 Fire and Air foreshew winds 174
 Fish of the Sea, put into fresh water 147, 148
 Fishes foreshew rain 175
 Fishes greater then any Beasts, 184. The cause ibid.
 Fixation of Bodies 169
 Flame and Air mixt not, 8. Except in the Spirits of Vegetables, ibid. And of living creatures, ibid. Their wonderful effects mixed, 9. Form of Flame would be Globular, and not Pyramidal, ibid. Would be a lasting Body, if not extinguished by Air, ibid. Mixeth not with Flame, ibid. Burns stronger on the sides, then in the midst, ibid. Is irritated by the Air ambient, ibid. Opinion of the Peripateticks of

of the Element of Fire, *ibid.* Prayeth upon Oil, as Air upon Water, 24. Taketh in no other body into it, but converteth it, 169. Flame causing water to rise, 192. Flame, 81. The continuance of it according to several Bodies, *ibid.* Observation about going out of Flame, *ibid.* 82. Lasting thereof, in Candles of several mixtures, *ibid.* Of several Wicks, *ibid.* 83. In Candles laid in Bran, *ibid.* In Lamps, *ibid.* Where it draweth the nourishment far, *ibid.* In a Turretted Lamp, *ibid.* Where it is kept close from Air, 83. According to the temper of the Air, *ibid.* 84. irritated by cold. *ibid.*

Flesh dissolved into Fat, 139. Flesh edible and not edible, 186. The causes of each, *ibid.* Horses flesh sometimes eaten, *ibid.* Mans flesh likewise, *ibid.* Eaten by Witches *ibid.* Flies in excess, sign of a Pestilential year, 155. The cause. *ibid.*

Flights of Birds, the swiftest motion, 139. The cause thereof. *ibid.*

Flint laid at the bottom of a Tree, hath helped the growth, 93. The cause *ibid.*

Flowers smell best whose Leaves smell not, 86. Flowers growing among the Corn, and no where else, 108. To have Flowers grow upon Trees, 102. To induce colour into Flowers, *ibid.* Flowers double, 109. To make them so in fruitful Trees, *ibid.* Flowers, 121. All exquisitely figured, *ibid.* Numbers of their Leaves *ibid.*

Flying in the Air of a Body unequal, 167. Of a Body supported with Feathers 191

Forming of parts in young Creatures. 7

Forreign Plants 118, 119.

Fouls, Water fouls, foreshew Rain 175

Fragile Bodies, 180. The cause of the fragility *ibid.*

French man hurt in the head, hard to cure 166

Fryer Bacons Illusion 160

Friction, a furtherer of nourishment, 16. Maketh the parts more freshly, 190. The cause, *ibid.* Impinguateth more then Exercise, *ibid.* The cause *ibid.*

Frogs in excess, a sign of a pestilential year, 155. The cause *ibid.*

Fruits, their maturation, 70. The causes thereof, *ibid.* Several instances thereof, *ibid.* 71. The dulcoration thereof, by other means, 186. The several causes *ib.*

Fruit pricked as it groweth, ripens sooner, 96. Fruit-tree grafted upon a wild tree, 97. Fruit dulcorated, by applying of Swines dung, 98. The cause, *ibid.* Also by Chaff and Swines dung mingled, *ibid.* Enlarged by being covered with a Pot as it groweth,

ibid. Fruits compound, 100, 101. Fruits of divers kinds upon one Tree, 107. Fruits of divers shapes and figures, *ibid.* 108. Fruits with inscriptions upon them, *ibid.* Fruits that are red within, 109. Fruits coming twice a year, 119. Fruits made without core or stone, 110. Fruits that have juices fit for drink 130. Unfit, *ibid.* The cause of each, *ibid.* Fruits sweet before they be ripe, 132 Which never sweeten, *ibid.* Fruits blossoming, hurt by South winds 135

Fuel not consuming, 163, 164. Fuel consuming fast, *ibid.* Fuel cheap, *ibid.*

Full of the Moon, 193. Several effects of it, *ibid.* Tryals for further observations 194

Fumes taken in Pipes. *ibid.* 202

G

Galilæus his opinion of the Ebbing and Flowing of the Sea 167

Gaping a motion of Imitation 65

Garments, of what Plants they may be made 128.

Gathering of wind for freshness 164

Generation, opposed to corruption 73

Generating of some Creatures at set times onely, of some at all times, 139. The cause of each *ibid.* 160

Genius over-mastering 204

Germination accelerated by several means, 90, 91, 92. Retarded by several means 92

Guiony-Pepper causeth sneezing 202

Glass, the materials thereof in Venice 162

Glass out of Sand. 164. Glass, whether remoulten, it keepeth weight 169

Globes at distance appearing flat 190

Glowworm 149

Gold, 71. The making of it, *ibid.* A work possible, but not rightly pursued, *ibid.* Discourse of a Stranger, touching the making of it, 72. Directions for the making of it, *ibid.* 73. Direction of a Tryal, *ibid.* Several properties of Gold, *ibid.* Gold hath in it the least volatile of any Metal 169

Cont, order in curing it 16

Grafting, 92. A late coming fruit upon an early Fruit-tree, 93. Grafts in great plenty, 95. Grafting meliorateth the Fruit, 97. Grafting of Trees that bear no fruit, enlargeth the Leaves, 100. Grafting of several kinds, maketh not Compound fruits *ibid.*

Grafting Vine upon Vine 136

Grapes, how they may be kept long, 129. Also by preserving of the stalk *ibid.*

Gravity, 100. Motion of Gravity, *ibid.* 148

Opinion

Opinion of moving to the Centre, vanity 10
Greatness, comparative of living Creatures 184
Greenness in some Plants all Winter, 121,
122. The cause, ibid.
Grief and pain, 150. The impressions there-
of, ibid.
Growing of certain Fruits and Herbs, after
they are gathered, 7, 8. The cause, ibid.
Tryal, whether they increase in weight ib.
Growing or multiplying of Metals. 168
Gum of Trees 2
Gun powder, 8. The cause of the great noise
it yieldeth, ibid. White, giveth no sound
130

H.

Hairs of Beasts, not of so fresh colours
as Birds feathers, 2. How the colour of
them may be changed, 24, 25. Hair on
the Head of Children new born, 139.
Hair changing colour, 183. Hair of the
party, 5. Beloved worn, exciteh love
213
Hands have a sympathy with the head and o-
ther parts. 15, 126.
Hard substances in the Bodies of living crea-
tures, 157. Most about the head, ibid.
Some of them stand at a stay, some con-
tinually grow, ibid. All of them without
Sense, but the Head 158
Hard Bodies, 181. The cause ibid.
Heart of an Ape worn, increaseth audacity
210
Haws and Heps in store, portend cold Winters
155
Head cut off in some Creatures leaveth a
little space of motion, 88. The causes, ibid.
Healthful Airs oft times without sent 199,
200
Hearing hath more operation upon the Man-
ners and Spirits of Men, then other senses,
31, 32. Hindrances of Hearing, 62
Hearing hindered by Yawning, ibid. The
cause, ibid. Helped by holding the breath,
ibid. The cause, ibid. Instruments to help
the Hearing, ibid. Used in Spain ibid.
Heat the chiefest power in Nature 27.
How to make tryal of the highest operation of
it, ibid. Heat and time work the like effects,
65. Their different operation in many
things, ibid. Heat being qualified by
Moisture, the effect, 140. Heat causeth
the differences of Male and Female, 184.
Also many other differences thereupon,
ibid. The same tempered with moisture,
ibid. The several effects of Heat, in the

Sun, Fire, and Living Creatures, ibid.
Heat within the Earth, 191. Tryal of
drawing it forth by the Moon-beams 193
Heats under the Equinoctial, less then under
the Torrid Zones, 87. Three causes thereof
ibid.
Heathen opinion touching the Generation of
Creatures, perfect by Concretion; refell'd
194
Heavenly Bodies, true Fires 195
Hedg-hogs flesh, a good drycr 113
Heliotropia, 114. The causes of their open-
ing and shutting, or bending towards the
Sun ibid.
Hemlock causeth easie death 132
Herbs removed from Beds into Pots prosper
better, 98. Grow sweeter by cutting off
the first Sprout, 99. The cause thereof
ibid. Inquiry, whether they be made Me-
dicinable, and how, 105. Four designati-
ons of it, ibid. Their ordinary colours, 109.
Herbs growing out of the water without
Roots, 117. Growing out of the top of
the Sea without Roots, ibid. 118. Grow-
ing out of Snow, ibid. Growing out of
Stone, ibid. Growing in the bottomes of
Mines, ibid. None growing out of Sea-
sands, ibid. Herbs dying yearly, ibid. That
last many years, ibid. The largest last not
longest, as the largest Trees do, ibid. The
cause, ibid. Herb in likeness of a Lamb,
127. The Fable of it, ibid. Herbs will
shew the nature of the ground, 135. Herbs
which like to be watered with Salt-water,
137. Herbs foreshew Rain. 176
Hiccough, 140. The cause of it, ibid. Means
to cease it ibid.
Honey, 127, 183. Several ways how it is
used, ibid.
Honey-dews upon certain Leaves and Flowers
104
Horn, 157. Horn'd Beasts have no upper
Teeth 158
Horses flesh eaten, 186. Horses Tooth the mark
of their age, 158. Horse-tooth Ring, good
for the Cramp 111, 112.
Hot Bread nourishing in the odors thereof
203
Humorsill lodged, very dangerous 18

I.

Iod a most pernicious smell 201
Jews ear 115
Image, whether it might be seen without see-
ing the Glass 160
Imagination exalted, 198. Force of it, ibid.
199. Three Cautions about the same;
Worketh most upon weak persons, ibid.
em.

Imagination, 206. The kinds of it, <i>ibid.</i>	Iniquation or Inconcoction	172
The force of it upon another Body, <i>ibid.</i>	Inscriptions upon Fruits	108
207. Several instances of it, <i>ibid.</i> & in	Insecta, 143. The name communicated to all	
Seq. An instance thereof by a Pair of	Creatures, bred of Putrefaction, <i>ibid.</i>	
Cards, <i>ibid.</i> Three means to impose a	The difference of them according to the	
Thought, 206, 207. Designation for tryal	several matters they are bred of, 143,	
of the operations in this kind, <i>ibid.</i> 207	144, 145. The innumeration of many of	
To work by one that hath a good opinion	them, <i>ibid.</i> Several properties in them,	
of you, <i>ibid.</i> To work by many, <i>ibid.</i>	<i>ibid.</i> They have voluntary motion, <i>ibid.</i>	
Means to preserve Imagination in the	Other Senses, beside Taste	<i>ibid.</i>
strength, <i>ibid.</i> It worketh more at some	Invisibles in Bodies ought to be better inqui-	
times, then others, <i>ibid.</i> It hath most	red	26
force upon the highest motions, <i>ibid.</i> 208,	Jovianus the Emperor	202
209, 210. effects of the Sense	Joy, 150. The impressions thereof	<i>ibid.</i>
Imaginations imitating the imitations of	Joynts in some plants, 121. The cause there-	
Nature, 1. Imitation in Men, and other	of	<i>ibid.</i>
Creatures, 55. A thing to be wondred	Ippocras clarified	2
at, <i>ibid.</i> Several motions in Men of Imit-	Iron Instruments, hurtful for wounds	166
ation	Islanders Bodies	85
Impressible, and not impressible	Ivy growing out of a Stag's Horn	115
Impulsion and percussion of Bodies, 160, 161.	Juices of Fruit fit for Drinks, 120. Unfit	
Impulsion of a Body unequal	for them, <i>ibid.</i> The cause of each	<i>ibid.</i>
Inanimate and Animate, wherein they differ		
	L.	
125	Adanum	128
Incense, thought to dispose to devotion by the	Lard put to waste, taketh away Warts	213
operation of the smell	Latitude	154
Incubus, how helped	Lasting Trees and Herbs, 120. Designation	
Indian Earth brought over, hath produced	to make Plants more lasting then ordina-	
Indian Plants, 118. Indian Fig	ry	<i>ibid.</i>
Indian Tree with Leaves of great largeness,	Late Flowers and Plants	119
and Fruit without stalks	Laughing, 151, 152. The impressions there-	
<i>ibid.</i>	of	<i>ibid.</i>
Induration of Bodies, 22. Three means to	Leaning long upon any part	154, 155
effect it, <i>ibid.</i> Examples thereof, <i>ibid.</i> 23.	Leaping, 145. Helped by weights in the	
Indurations by Snow or Ice, <i>ibid.</i> By Me-	bands.	<i>ibid.</i>
talline waters, <i>ibid.</i> In some natural	Leaves nourish not, 12. The cause	130
Spring-waters, <i>ibid.</i> Of Metals by heat-	Leaves of Trees and Herbs, 127. Plants	
ing and quenching, <i>ibid.</i> By fire, <i>ibid.</i>	without Leaves	192
By Decoctions within water, the water not	Left-side and Right, 190. Senses alike, strong	
touching, <i>ibid.</i> 24. Induration by Sym-	on each side, Limbs strongest on the Right,	
pathy	<i>ibid.</i> The cause of each	<i>ibid.</i>
182	Life, by what courses prolonged	64
Infant in the Womb, suffering from the Mo-	Lights over-great offend the eyes	188, 189
thers diet	Light comforteth the Spirit, 211. Especially	
Infectious Diseases	Light varied	<i>ibid.</i>
65	Lincostis	132
Influences of the Moon, 192, 193, 194. In	Liquefiable, and not Liquefiable, 180. Bodies	
number four	that Liquefie by Fire, <i>ibid.</i> Others that	
<i>ibid.</i>	by water, <i>ibid.</i> Some that by both, <i>ibid.</i>	
Influxes of the heavenly Bodies.	Liquors, their Clarification, 67. Three	
200	causes thereof, <i>ibid.</i> 68. Preservation of	
Infusion in Liquors, 4. A short stay best,	Liquors in Wells or Vaults, 85. Liquors	
<i>ibid.</i> Infusions to be iterated, <i>ibid.</i> Use-	compressed, 187. Their incorporation with	
ful for Medicinal operations, <i>ibid.</i> Tryal	powders	65
which parts issue soonest, which slowest, 3.	Living Creatures that generate at certain	
Evaporations of the finer Spirits, some-	seasons onely, 159. Others that at all	
times useful	seasons, <i>ibid.</i> The cause of each, <i>ibid.</i>	
<i>ibid.</i>	Their	
Infusion maketh Liquors thick, but Decoction		
clearer, 68. The cause		
<i>ibid.</i>		
Infusions in Air, 5. The several odours issue		
at several times		
<i>ibid.</i>		
Infusion in Earth, 83, 84. The effects of it,		
<i>ibid.</i> Cautions to be used in it, <i>ibid.</i> Se-		
veral instances thereof		
<i>ibid.</i>		

Their several times of bearing in the Womb, *ibid.* 160. The causes thereof, *ibid.* The several numbers which they bring forth at a Birth, *ibid.* The causes thereof, *ibid.* Living creatures that will be transformed into another species, 111. Living creatures forebode weather 175
 Love 203
 Lucciole in Italy 149
 Lupines 136
 Lust, 152. The impressions thereof *ibid.*
 Lying, in what kind of posture healthful 154

M.

Magical operations 128, 200, 204
 Maiz 13
 Male and Female, the difference of them in several living creatures, 84. The causes thereof, *ibid.* 185. Male and Female in Plants, 126. Male-peony, good for the Falling-sickness and Incubus 209
 Maleficiating, 192. Practised in Galcony *ibid.*
 Malt, 123. The swelling thereof, *ibid.* The sweetness thereof *ibid.*
 Mans-flesh eaten, 6. Breeder the French Disease, *ibid.* Causeth high Imaginations, *ibid.* Not in it self edible, 186 The cause, *ibid.* How eaten by Cannibals, *ibid.* Wherefore by Witches *ibid.*
 Mandrakes 128
 Nanna 165
 March, towards the end, the best discoverer of Summer Sicknesses 173
 Marl, a good compost 122, 123
 Marrow 157, 158
 Maturation, 179. Of drinks, 69, 70. Of Fruits, *ibid.* Maturation of Digestion, 71, 73
 Meats inducing satiety 66
 Medicines changed helpful, 18. Medicines which effect the Bladder, 25. Medicines condensing, which relieve the Spirits, 155
 Medicinal Herbs 10, 105
 Megrims come upon rising, not during the sitting 154
 Melancholy persons dispose the company to the like 26
 Melioration of Fruits, Trees, and Plants, 93, 94, 95, 96, 97, 98, 99, 100
 Mel-cottons grow best without grafting 97. The cause thereof *ibid.*
 Memory the Art, 207. Men, better places then words, *ibid.* Memory strengthened by the Brains of some creatures 210
 Menstruous women 202
 Mercurial and Sulphurous 78

Metals and Plants wherein they differ, 126.
 Growing of metals, 168. Drowning of metals, *ibid.* 169. Refining of metals, 183. Metalline Vapors hurtful to the Brain, 202. Metals give orient colours in their dissolutions, 64. The causes thereof, *ibid.*
 Milk warm from the Cow, a great nourisher, 14. How to be used, *ibid.* Cows Milk better then Asses Milk, or then Womens Milk, *ibid.* Milk in Beasts, how to be increased 164. Milk used for Clarification of Liquors, 69. Good to steep divers Seeds in, 98. Preserving of Milk, 85. Milk in Plants 131
 Mildew 104, 136
 Minced meat, a great nourisher, 14. How to be used *ibid.*
 Mistletoe 116
 Mixture of Earth and Water in Plants 79
 Moist Air, how discovered 173
 Moisture adventitious, cause of putrefaction, 68. Moisture qualifying heat, the effect, 140. Moisture increased by the Moon, 193. Tryal of it in Seeds, *ibid.* In mens bodies, *ibid.* Force of it in Vegetables 103, 104
 Monsters 100
 Moon attractive of heat out of Bodies 20
 Moons influences, 192, 193, 194. In number four, *ibid.* It increaseth moisture, *ibid.*
 Morfus Diaboli, an Herb 134
 Mortified parts by cold, 166. Must not approach the fire, *ibid.* Cured, by applying Snow, *ibid.* Or warm water *ibid.*
 Moss, 75, 113. Where it groweth most, *ibid.* The cause of it, *ibid.* What it is, *ibid.* Moss sweet, 114. In Apple-trees sweet, *ibid.* In some other Trees 132
 Mother suppressed by burning Feathers 204
 Mothers diet affecteth the Infant in the Womb 210
 Motion hindreth Putrefactions 75
 Motion of Bodies, 161. Motion of Liberty 3
 Motion of Nexes, 192. Motion of Consent in mans Body, 10, 17. Motion of Attraction would prevail if Motion of Gravity hindered not 148
 Motions in men by Imitation 65
 Moulding of Fruits 108
 Moulds 75
 Mountains great forebode Tempests early 174
 Mouth out of taste, 141. What tastes it will not have *ibid.*
 Mulberry-leaf 161
 Mummy stancheth Blood 210
 Murdered body, bleeding at the approach of the murderer 207
 Muscovia

Muscovia hath a late Spring and early Harvest, 119. The cause	ibid.
Mushrooms, 115. Their properties, ibid.	
Several productions of them, ibid. Where they grow most	131
Musick, 29. Musical and Immusical sounds, ibid. Bodies producing Musical sounds, ibid. 30. Diapason the sweetest of sounds, ibid. Fall of Half-notes necessary in Musick, ibid. Consent of Notes to be ascribed to the Ante-notes, not Entire Notes, 30. Concords Perfect, and Semi-perfect, which they are, ibid. The most odious Discords of all other, ibid. Discords of the Base, most disturbeth the Musick, ibid. 31. No Quarter-notes in Musick, ibid. Pleasing of single Tones, answereth to the pleasing of Colour, and of Harmony to the pleasing of Order, ibid. Figures or Tropes in Musick have an agreement with the Figures in Rhetorick, ibid. Musick hath great operation upon the manners and spirits of Men, ibid. 1, 32. Concords and Discords in Musick, are Sympathies and Antipathies of Sounds 61. Instruments that agree best in Consort, ibid. Instruments with a double Lay of Strings, Wire, and Lute-strings,	62
N	
Nature, 63. Advice for the true inquisition thereof	ibid. 64.
Natural Divination	172
Negroes	88
Night-showres better for Fruit, then Day showres	135, 136
Nights Star-light, or Moon-shine, colder then cloudy	188
Nilus, the virtues thereof, 161. How to clarify the water of it	ibid.
Nitre, good for men grown, ill for Children, 78. Nitrous water, 80. Scourish of it, self, ibid. Nitre mingled with water, maketh Vines sprout, 96. Nitre upon the Sea-sands	163
Nourishing Meats and Drinks	12, 13
Nourishing parts in Plants	14, 130
Nourishment, 14. Five several Means to help it	ibid. 15, 16
Nourishment mended, a great help	95
Numa's two Cousins	163
O.	
Oak-leaves gather Honey dewes	104
Oak-boughs put into the Earth, bring forth wild Vines, 111. Oak apples, 111	
Oak bears the most fruit among Trees, 157, 158. The cause	ibid.
Objects of the sight, cause great delight in the Spirits, but no great offence, 189. The cause	ibid.
Occhus, a Tree in Hyrcania	127
Odious Objects cause the spirits to flee	167
Odors in some degree nourish	202
Oyntment used by Witches	210
Old Trees bearing better then the same new	128
Old men conversing with young company, live long	203
Onions made to wax greater, 99. In growing, carry the seeds to the top	193
Operations of Sympathy	200
Opium	20
Order in curing of diseases	16, 17.
Orange-flowers infused, 4. Orange-seeds sown in April, will bring forth an excellent Sallet herb	119
Orris-root	187
Ox horn bringeth forth Ivy	115
Oily substances and watry, 76. Commixture of Oily substances, prohibiteth Putrefaction, ibid. Turning of Watry substances into oily, 79. A great work in Nature, ibid. Some instances thereof	ibid.
Oyl of Sweet-Almonds, a great nourisher, 14. How to be used	ibid.
P	
Palliation in Diseases	17
Pain and grief, 150. The impressions thereof	ibid.
Paintings of the Body, 155. Barbarous people much given to it	156, ibid.
Panicum	95
Pantomimi	56
Paper chamoletted	156
Paracelsus's Principles	78, 79
Parents finding an alteration upon the approach of their children, though unknown to them	204
Parts in living creatures easily reparable, and parts hardly reparable, 16. Parts of living creatures severed, 216. Their virtues in Natural Magick,	ibid.
Passions of the mind, 150, 151, 152. Their several impressions	ibid.
Peaches prove best without grafting, 97. The cause thereof	ibid. 110
Pearl said to recover the colour by burial in the Earth	84
Pepper	

Pepper Guinny, causeth sneezing 202
 Perception in all bodies, 17. More subtil
 then the sense, *ibid.* It worketh also at
 distance, *ibid.* The best means of prog-
 nosticating *ibid.* 172
 Percolation, inward and outward 1, 2
 Percussion and impulsion of bodies 160, 161
 Perfumes Dryers, and Perfumes Moistners of
 the Brain, 203. Perfumes procure pleasant
 and propheticall Dreams 204
 Persons near in blood, or other Relations,
 have many secret passages of Sympathy
 211
 Pestilential years, 85. Their prognosticks
 155, 172, 173
 Philosophy received 178
 Pilosity in Men and Beasts, 139. The causes
 thereof *ibid.*
 Pistachoes 13
 Pit upon the Sea-shore, 1. Filled with water
 potable, *ibid.* Practised in Alexandria,
ibid. And by Cæsar, *ibid.* Who mistook
 the cause, *ibid.* In time will become Salt
 again 191
 Pity 151. The impressions thereof *ibid.*
 Pits Quintus his revelation, touching the
 victory at Lepanto 212
 Plague transmitted without sent, 200, 201.
 The supposed sent of it, *ibid.* Persons
 least apt to take it, and persons most, *ibid.*
 Plagues caused by great putrefactions, 202
 Preservatives against it 209.
 Plane-trees, watered with Wine 128
 Plants, why of greater age then li-
 ving creatures, 15, 16. Dignity of
 Plants, 89. Acceleration of their Ger-
 mination, *ibid.* 90, 91, 92. Retarding
 of their Germination, *ibid.* The Melio-
 ration of them divers ways, 93, 94, 95,
 96, 97, 98, 99, 100. Cause why some
 die in Winter, 96. Sympathy and Anti-
 pathy of Plants, 10, 102, 103, 101,
 Plants drawing the same juyces out of
 the earth, thrive not together, 102.
 Drawers of much nourishment, hurt
 their neighbor-plants, *ibid.* Drawing
 several juyces, thrive well together, 101
 several instances of each, *ibid.* Desig-
 nations of further tryals hereof, *ibid.*
 Tryals in Herbs, poisonous or purgative,
 103. Plants that die placed together,
ibid. Tryal whether Plants will attract
 Water at some distance, 104. Curiosities
 touching Plants, 107, 108, 109, 110.
 Plants will degenerate, 110, 111. The
 several causes thereof, *ibid.* Transmu-
 tation of Plants, *ibid.* Six designations
 thereof, *ibid.* 112, 113. Their several
 excreferences, 113, 114, 115, 116, 117.

Prickles of Trees, 116. Plants growing
 without seed, 117, 118. Growing out of
 stone, *ibid.* Plants forreign, *ibid.* 119.
 Removed out of hot Countreys will keep
 their seasons, *ibid.* Set in the Summer
 seasons will prosper in colder Countreys,
ibid. Seasons of several Plants, *ibid.*
 Plants bearing blossoms, and young fruit,
 and ripe fruits together, 119, 120.
 Plants with joynts or knuckles in the
 stalks, 121. The causes thereof, *ibid.*
 Differences of Plants, *ibid.* 122. Some
 putting forth blossoms before leaves, 121.
 Others, leaves before blossoms, *ibid.* The
 cause of each, *ibid.* Plants green all
 winter, 121, 122. The cause, *ibid.* Plants
 not supporting themselves, *ib.* The cause
 of their slenderness, *ibid.* Plants and in-
 animate bodies differ in four things, 125
 126. Plants and Metals in three, *ibid.*
 Plants and Moulds, or Putrefactions,
 wherein they differ, *ibid.* Plants and liv-
 ing Creatures their differences, 126
 127. Male and Female in Plants, *ibid.*
 Plants whereof Garments are made, 128
 Plants sleeping, *ibid.* Plants with bearded
 Roots, *ibid.* Plants esculent, 129, 130.
 Esculent raw, *ibid.* Having passed the
 fire, *ibid.* Parts in Plants that are nourish-
 ing, *ibid.* Seeds in Plants, more strong,
 then either Leaf or Root, *ibid.* The cause
ibid. In some not, *ibid.* Plants with
 Milk in them, 131. Plants with red
 juyce, 132. No Plants have a salt taste
ibid. Plants with curled Leaves, 133
 Plants may be translated into other Regi-
 ons, 135. Yet they like some soils, more
 then other, *ibid.* Several instances there-
 of, *ibid.* Plant without Leaves, 162. Sin-
 gularities in several plants 138
 Plaster hardened like Marble 165
 Plastered room green, dangerous 202
 Places of Metals assuage swelling 187
 Pleasures and displeasures of the Senses
 145
 Plough followed, healthful 103
 Plumosity in Birds, 139. The cause thereof
ibid.
 Plumes of what colour the best, 109. The
 dryer, the better sort *ibid.*
 Pneumatics in Bodies 181
 Pomanders 203
 Pont-Charenton, the Ecchymose 57
 Pore-blinde men see best near hand, 188.
 The cause *ibid.*
 Potado-roots potted, grow greater
 powder in shot 90
 Powders and Liquors, their Incorporation
 65
 reasoning

Poysoning of air	201	
Poysoning by smells, <i>ibid.</i> 202. Caution touching poysoning	<i>ibid.</i>	Q
Poysonous Creatures love to lie under	Odorate	Q
Herbs	138	Urries that grow hard
Precious stones comfort the spirits	208	Quick silver will conserve
Preservation of bodies from corrupt	28	Bodies
Preservation of Fruits and Sirrups,	129	Quick silver fixed to the hardness of Lead
Also in powders, <i>ibid.</i> When to gather fruits for preservation. <i>ibid.</i> Also in Bottles in a well, <i>ibid.</i> Preserving Grapes long, <i>ibid.</i> Another way thereof	134	182
Prickles of Trees	116, 117	R.
Procreations by copulation, and by putrefaction, 194. The cause of each, <i>ibid.</i>	195	R
Prognosticks for plenty or scarcity, 138. Of pestilential years, 141, 155, 172, 173. Of cold and long winters, 174. By Birds, 175. Of an hot and dry summer, <i>ibid.</i> By the Birds also, <i>ib.</i> Of winds, <i>ib.</i> Of great tempests, <i>ibid.</i> Of rain, <i>ibid.</i> From living creatures, <i>ibid.</i> From water fowls and land fowls, 176. From fishes, <i>ibid.</i> From beasts, <i>ib.</i> From herbs, <i>ibid.</i> From aches in mens bodies, <i>ibid.</i> From worms, <i>ibid.</i> From the sweating of solid bodies, <i>ibid.</i>	195	R
Proprieties secret	117, 214	Reeking of Wine and Beer
Purging Medicines, 5. Have their virtue in a fine spirit. Endure not boiling, <i>ibid.</i> Taking away their unpleasant taste, <i>ibid.</i> Several ways of the operations of purging Medicines, 10, 11, 12. They work upon their proper Humors, 11. Medicines that purge by stool, and that purge by urine, 12. The several causes, <i>ibid.</i> Work in these ways as they are given in quantity, <i>ibid.</i> Preparations before purging, 18. Want of preparatives: what hurt it doth, both in purging, <i>ibid.</i> And after purging	<i>ibid.</i>	Rain in Egypt scarce, 161. The cause thereof, <i>ibid.</i> Several prognosticks of Rain
Putrefaction, 73. Acceleration of it, <i>ibid.</i> The cause of putrefaction, <i>ibid.</i> Putrefaction, whence, 74. Ten means of inducing putrefactions, <i>ibid.</i> Prohibiting of putrefaction, 75. Ten means of prohibiting it, <i>ibid.</i> 76. Inceptions of putrefaction, 79. Putrefactions for the most part smell ill, 177. The cause, <i>ibid.</i> Putrefaction from what causes it cometh, 178. Putrefaction induced by the Moon-beams	192	Rainbow said to bring sweetness of odor to Plants under it
Putrefactions of living creatures have caused Plagues	102	Rams skins good to be applied to wounds
Putrified bodies most odious to a creature of the same kind	<i>ibid.</i>	Red within some few fruits
Pyrrhus had his Teeth undivided	158	Red juyce in Plants
Pythagoras his Philosophy	197	Reeds
		Refining of Metals
		Refraction causeth the species visible to appear bigger, 160. Other observations about Refractions
		<i>ibid.</i>
		Repletion hindreth Generation
		Rest causeth putrefaction
		Retardation of Germination
		Rew helpeth the Fig-tree
		Rheumes, how caused
		Rice a nourishing meat
		Right side and left, 190. Senses alike strong on both sides, Limbs strongest on the Right. <i>ibid.</i> The cause of each
		<i>ibid.</i>
		Rooms built for health
		Roots of Fruit trees multiplied, 93, 94. Root made great, 95. By applying Panicum about it, <i>ibid.</i> Roots potted, grow greater, 99, 100. Roots preserved all winter, <i>ibid.</i> Roots of Trees that descend deep, 133, 134. Others that spread more, <i>ibid.</i> The cause of each, <i>ibid.</i> Roots of Plants of three sorts, Bulbous, Fibrous, Hirsute
		128
		Rosa Solis the Herb
		Roses Damask how conserved
		81
		Rubarb infused, 4, 5. For a short time best, <i>ibid.</i> Repeated may be as strong as Scammomy, <i>ibid.</i> A Benedict Medicine
		5
		Caution in taking thereof
		11
		Rust of Metals
		74
		S.
		Satiety in Meats
		66
		Salamander, 186, 187. The cause that it endureth the fire
		<i>ibid.</i>
		Salt a good Compost, 133. Salt in Plants, 132
		Salt

Salt hath a sympathy with Blood, 211. It is an healer, *ibid.* It riseth not in Distillations 190, 191
Salt-petre, how it may be bred 123
Salt-water passed through Earth, becomes fresh, 1. Four differences between the passing it in Vessels and in Pits, 2. Salt-water good for to water some Herbs, 137, 138.
Salt-water boiled, becomes more potable, 190, 191. Salt-water sooner dissolving Salt, then Fresh-water, *ibid.* The cause *ibid.*
Sand turning Minerals into a Glassy substance 164
Sanguis Draconis, the Tree that bears it 132
Sap of Trees, 134. The differing nature thereof in several Trees *ibid.*
Scarlet-dye 191, 192
Scissible and not scissible 182
Sea clearer the North-wind blowing, then the South, 139. Sea, by the bubbles fore-sheweth wind, 175. Sea-water looketh black, moved; white, resting, 139. The cause, *ibid.* Seas shallow and narrow, break more then deep and large 190
Sea-fish put into Fresh-waters 147
Sea-bare coming near the Body, hurteth the Lungs. 211
Sea-sand a good Compost, 123. Sea-sands produce no Plant 118
Seasons of Plants 119
Secret proprieties 214, 215
Secundine 154
Seeds in plants, more strong then either Leaf or Root, 120. The cause, *ibid.* In some not, *ibid.* Seeds, their choice, 137. Plants growing without Seeds 117, 118
Senses, their pleasures and displeasures, 145. Their instruments have a similitude with that which giveth the reflection of the object 62
Separation of several Natures by straining 2. Of several Liquors by weight, 3. And of the same kind of Liquors thickned, 4. Of Metals 169
Separation of the cruder parts prohibiteth Putrefaction 76
Serrues used in Turkey 148
Setting of Wheat 95, 96
Setting of Trees higher, or lower 99
Several Fruits upon one Tree 107
Shade helpeth some Plants 95
Shadows seeming ever to tremble 190
Shame, 151, 206. The impressions thereof 161
Shell-fish have no Bones within 157, 189, 190
Shifting for the better, helpeth Plants and Living Creatures 95

Shining wood 77, 78
Showres good for fruits, 135. For some not, *ibid.* Night-showres better than Day-showres 136
Showres after a long drought, cause sicknesses if they be gentle, 172. If great, not *ibid.*
Sicknesses of the Summer and Winter 84
Sight the object thereof, quicker then of Hearing, 50, 51. Sight, 188, 189. Objects thereof, cause great delight in the Spirits, but no great offence, *ibid.* The cause *ibid.*
Silver more easily made than Gold 71, 72
Simples special for Medicines, 141, 142. Such as have subtil parts without Accrimony, *ibid.* Many creatures bred of Putrefaction, are so, *ibid.* Also Putrefactions of Plants *ibid.*
Singularities in several Plants 138
Sinking of Bodies, 163. The cause *ibid.*
Sitting healthful 154
Skull 157
Sleep a great nourisher, 15. Sleep, 156, 157 Hindred by cold in the Feet, *ibid.* Furthered by some kind of noiser, *ibid.* Nourisheth in many Beasts and Birds, *ibid.* Sleeping creatures all winter 194
Sleeping Plants 128
Smells and Odors, 86. Best at some distance *ibid.* Best where the Body is crushed, *ibid.* Not so in Flowers crushed, *ibid.* Best in Flowers, whose Leaves smell not, *ibid.* Smells sweet, 177. Have all a corporeal substance, *ibid.* Smells fetide, *ibid.* 178. Smell of the Faol most pernicious, 201. Smells that are most dangerous *ibid.*
Snake-skin worn 209
Sneezing ceaseth the Hiccough, 104. Induced by looking against the Sun, *ibid.* The cause thereof *ibid.*
Snow-water, 87. Snows cause fruitfulness, *ibid.* Three causes thereof, *ibid.* Snow good to be applied to a moriified part, 166. The cause thereof, *ibid.* Snow bringeth forth Herbs 118
Soals of the Feet, have a sympathy with the Head 25
Soft Bodies, 181. The cause, *ibid.* They are of two sorts *ibid.*
Solid Bodies sweating foreshew Rain 176
Soot a good Compost 123
Sorel, 137. The Root thereof *ibid.*
Soul of the World 197, 198
Sounds Musical and Immusical 29
Sounds more apt to procure sleep then tones, 31. The cause, *ibid.* Nature of Sounds, not sufficiently inquired, 32. Motions great in Nature without Sounds, *ibid.* Nullity

- Nulity and Entity of Sounds *ibid.* 33.
 34. Swiftneſs of Motion, may make Sounds inaudible, *ibid.* Sounds not an E-
 liſion of the Air, *ibid.* The reaſons there-
 of, 35. Sound not produced without ſome
 local motion of the Medium, *ibid.* Yet
 diſtinction to be made betwixt the motion
 of the Air, and the Sounds themſelves,
ibid. 36. Great Sounds cauſe great mo-
 tions in the Air, and other Bodies, *ibid.*
 Have rarified the Air much, *ibid.* Have
 cauſed Deafneſs, *ibid.* Encloſure of Sounds
 conſerveth them, *ibid.* Sounds partly in-
 cloſed, and partly in open Air, *ibid.* Better
 heard from without, then from within,
ibid. A Semi-cave will convey Sound,
 better than open Air, *ibid.* Any long Pole
 will do the like, *ibid.* Tryal to be made in
 a crooked Concave, *ibid.* Sounds may be
 created without Air, 37. Difference of
 Sounds in different Veſſels filled with water,
ibid. Sound within a flame, *ibid.* Sound
 upon a Barrel emptier or fuller, *ibid.*
 Sound not created betwixt the Bow and
 the String, but betwixt the String and the
 Air *ibid.*
 Magnitude of Sound, 43. In a trunk, *ibid.*
 The cauſe thereof, *ibid.* In a Hunters
 Horn bigger at the lower end, 38. The
 cauſe thereof, *ibid.* In a Vault under the
 Earth, *ibid.* The cauſe thereof, *ibid.* In
 awks Bells, rather than upon a piece of
 Braſs in the open Air, *ibid.* In a Drum
ibid. Further heard by night, then by
 day, *ibid.* The cauſe thereof, *ibid.* In-
 creased by the concurrent reflection *ibid.*
 Increased by the Sound-board in Inſtru-
 ments *ibid.* In an Irish Harp, *ibid.* The
 cauſe of the loud ſound thereof, *ibid.* In
 a Virginal the Lid ſhut, *ibid.* In a Con-
 cave within a Wall, *ibid.* 38, 39. In a
 Bow-string, the Horn of the Bow laid to
 the ear *ibid.* 39. The like in a Rod of
 Iron or Braſs, *ibid.* The like conveyed by a
 Pillar of Wood, from an upper Chamber
 to a lower, *ibid.* The like from the bottom
 of a Well, *ibid.* Five ways of Majoration
 of Sounds *ibid.*
 Exility of Sounds through any porous body
ibid. 39. Through Water, *ibid.* 40. Strings
 ſtopped ſhort *ibid.*
 Damping of Sounds, *ibid.* With a ſoft Body
ibid. Iron bot, not ſo ſounding as cold, *ibid.*
 Water warm, not ſo ſounding in the fall as
 cold *ibid.*
 Loudneſs and ſoſineſs of Sounds, differ from
 Magnitude and Exility, 41. Loudneſs of
 Sounds, *ibid.* Quickneſs of percuſſion
 cauſe of the loudneſs *ibid.*
- Communication of Sounds, 41.
 Inequality of Sounds, 42. Unequal Sounds
 ingrate, *ibid.* Grateſul, *ibid.* Muſical
 and Immuſical Sounds at pleaſure only in
 Men and Birds, *ibid.* Humming of Bees
 an unequal Sound, 43. Metals quenched
 give an hisſing Sound *ibid.*
 Baſe and Treble Sounds, *ibid.* Two cauſes of
 Treble in Strings, *ibid.* Propoſition of the
 Air percuſſed in Treble and Baſe, 53.
 Tryal hereof to be made in winding up
 of a String, *ibid.* 44. In the diſtances of
 Frets, *ibid.* In the Bores of Wind-Inſtru-
 ments *ibid.*
 Interiour and Exterior Sounds, 45. Their diſ-
 ference, *ibid.* Several kinds of each *ibid.*
 Articulation of Sounds, 46. Articulate
 Sounds in every part of the Air, *ibid.*
 Winds hinder not the Articulation, *ibid.*
 Diſtance hindreth, *ibid.* Speaking under
 water hindreth it not, *ibid.* Articulation
 requireth a Mediocrity of Sound, *ibid.*
 Conſounded in a Room over an arched
 Vault, *ibid.* Motions of the Inſtruments
 of Speech, towards the forming of the Let-
 ters, *ib.* Inſtruments of Voice, which they
 are, *ibid.* 46, 47. Inarticulate Voices and
 Inanimate Sounds have a ſimilitude with
 divers Letters *ibid.*
 Motions of Sounds, 49. They move in
 round, *ibid.* May move in an arched Line,
ibid. Suppoſed that Sounds move better
 downwards than upwards, *ibid.* 50. Tryal
 of it *ibid.*
 Laſting of Sounds, *ibid.* Sounds continue not,
 but renew, *ibid.* Great Sounds heard at
 far diſtance, *ibid.* Not in the inſtant of
 the Sound, but long after, *ibid.* Object of
 Sight, quicker than Sound, 50, 51. Sounds
 vaniſh by degrees, which the Objects of
 ſight do not, *ibid.* The cauſe thereof *ibid.*
 Paſſage of Sounds through other Bodies, 51.
 The Body intercepting, muſt not be very
 thick, *ibid.* The Spirits of the Body inter-
 cepting, whether they co-operate in the
 Sound, *ibid.* Sound not heard in a long
 down-right Arch, *ibid.* Paſſeth eaſily
 through Foraminous Bodies, *ibid.* Whe-
 ther diminished in the paſſage through
 ſmall Crannies 52
 Medium of Sounds, *ibid.* Air the beſt Me-
 dium, *ibid.* Thin Air not ſo good as thick
 Air, *ibid.* Whether flame be a fit Medium,
ibid. Whether other Liquors beſide wa-
 ter *ibid.*
 Figures of the difference of Sounds, 52. Se-
 veral tryals of them *ibid.*
 Mixtures of Sounds, 53. Audibles mingle in
 the Medium, which Viſibles do not, *ibid.*

The cause thereof, *ibid.* Mixture without distinction, makes the best Harmony, *ibid.*
 Qualities in the Air, have no operations upon Sounds, *ibid.* Sounds in the Air alter one another. 54. Two Sounds of like loudness, will not be heard as far again as one, *ibid.* The cause thereof *ibid.*
 Melioration of Sounds, 55. Polished Bodies, created Sounds meliorate them, *ibid.* Wet on the inside of a Pipe doth the like, *ibid.* Frosty weather causeth the same, *ibid.* Mingling of open Air with pent Air, doth the same, *ibid.* From a Body equal, Sound better, 55. Intension of the Sense of Hearing, meliorateth them *ibid.*
 Imitation of Sounds, *ibid.* The wonder thereof in Children and Birds *ibid.*
 Reflexion of Sounds, 56. The several kinds, *ibid.* No refraction in Sounds observed, 58. Sympathy and antipathy of Sounds, 61. Concords and Discords in Musick, are sympathies and antipathies of Sounds, *ibid.* Strings that best agree in Consort, *ibid.* Strings tuned to an Unison or a Diapason, shew a Sympathy, 63. Sympathy conceived to cause no report, *ibid.* Experiment of Sympathy to be transferred to Wind-Instruments *ibid.*
 Effents of Sounds Spiritual, 63. Sounds, not Impressions in the Air *ibid.*
 Causes of the sudden Generation and Perishing of Sounds *ibid.*
 Conclusion touching Sounds. 63
 Sowness in Fruits and Liquors, 187. The cause of each, *ibid.* Sowing of Liquors in the Sun *ibid.*
 South-winds dispose Mens Bodies to heaviness, 64. South-winds hurtful to Fruit blossoming, 135. South winds without Rain, breed Pestilence, with Rain not, 166. The causes, *ibid.* On the Sea-coasts not so *ibid.*
 South-east, Sun better then the South west for ripening fruit *ibid.*
 Sparkling woods 133
 Species visible 160
 Spirits in Bodies, scarce known, 26. Several opinions of them, *ibid.* They are Natural Bodies rarified, *ibid.* Causes of most of the effects in Nature, *ibid.* They have five differing operations, 73. Spirits in Bodies. 125. How they differ in animate and inanimate, *ibid.* How in Plants and Living Creatures 126
 Again of Spirits in Bodies, 181. They are of two sorts, *ibid.* Motion of the Spirits excited by the Moon, 193. The strengthening of them prohibiteth Putrefaction 76

Spirits of Men flie upon odious object, 107
 The Transmission of Spirits, 198. & in sequentib. Transmission of them from the minds of Men, 203, 204, 206, 207, 208, 209. Such things as comfort the Spirits by sympathy, 208, 209. The strife of the Spirits, best helped by arresting them for a time *ibid.*
 Sponges 147
 Springs of water made by art 6
 Spring-water 87
 Sprouting of Plants with water only 133
 Squil, good to set Kernels, or Plumb-stones in 96
 Stags heart with a Bone in it 157
 Stanchers of Blood 210
 Stars lesser obscured, a sign of Tempests 174
 Sterility of the year, changeth Corn into another kind 111
 Stomach, the appetite thereof, 176. The qualities that provoke appetite, *ibid.* The four causes of appetite *ibid.*
 Stone wanting in Plumbs 110
 Stretching, a motion of imitation 65
 Stub old, putting forth a Tree of a better kind 111
 Stunting, 85. Two causes thereof *ibid.*
 Subterrany Fires 78
 Sucking long, ill for Children *ibid.*
 Sugar, 128, 183. The use of it, *ibid.* Draweth Liquor, higher then the Liquor cometh 21
 Sulphureous and Mercurial 78, 79
 Summer and Winter sicknesses, 84. The Prognosticks of a dry Summer 174
 Sun Tanneth, which Fire doth not, 87, 88. The cause *ibid.*
 Superfetation, the cause of it 116
 Super-Plants beside Mistletoe 135
 Supporting Plants of themselves, and not supporters 122
 Swallows made White, by anointing the Eggs with Oyl 211
 Sweat, 148. Parts under the Water, though hot sweat not, *ibid.* Salt in taste, *ibid.* Cometh more from the upper parts than from the lower, *ibid.* More in sleep than waking, *ibid.* Cold sweat commonly mortal, *ibid.* 149. Sweat, in what diseases good, in what bad, *ibid.* In some men have been sweet 2
 Sweet Moss, 114, 132. Sweetness of odor from the Rainbow, 176. Sweetness of odor, whether not in some water, *ibid.* In Earth found, *ibid.* Sweet smells, 177. Several properties of them, *ibid.* They have a Corporeal substance. *ibid.*
 Sweetness in Fruits and Liquors, 187. The cause

- cause of each, *ibid.* Sweet things commix-
 ed, prohibit Putrefaction, 76
 Swelling, how caused in the Body, 74. How
 it may be kept down, 187. Why it follow-
 eth upon Blows and Bruises *ibid.*
 Swelling of Grains upon Boiling, 185. The
 cause of the different swelling them *ibid.*
 Swimming of Bodies, 163, 166, 167. The
 cause 163
 Swines Dung dulcorateth Fruit, 98. The
 cause *ibid.*
 Swinging of Bottles, 68. The use of it *ibid.*
 Swoundings 203
 Sylva Sylvarum, the intension of it 24, 25
 Sympathy and Antipathy, 25. Sympathy in
 Plants, 98. Sympathy and Antipathy of
 Plants 101, 102, 103, 104
 Sympathy, 211. Instances thereof, *ibid.* 208,
 209. Sympathy, secret between Persons,
 near in blood, 210. Between great friends
 in absence, *ibid.* Sympathy betwixt Mul-
 titudes, *ibid.* Sympathy of Individuals
 213
 T.
 Tears of Trees 128
 Teeth, 141, 157. Their tenderness, 128
 Teeth set on edge by harsh sounds, 145.
 The cause, *ibid.* Sinews in them, the cause
 of their pain, not the Marrow, 158, 159.
 Their several kinds, *ibid.* Difference in
 several Creatures, *ibid.* Horned Beasts
 have no upper teeth, *ibid.* Tooth, the mark
 of Horses age, *ibid.* At what age they
 come forth in Men, *ibid.* What things
 hurt them, *ibid.* Chiefest considerations
 about the Teeth, 158. Restitution of Teeth
 in age, *ibid.* Whether it may be done or
 no *ibid.*
 Tempests, their predictions 174
 Tensile Bodies 181, 182
 Terra Lemnia 147
 Terra Sigillata communis *ibid.*
 Thales 138
 Thistle-down flying in the Air, foresheweth
 wind 175
 Timber, 134. The several natures thereof,
ibid. The several uses according to the
 Nature of the Tree 135
 Time and heat work the like effects, 65. Their
 different operations in many things *ibid.*
 Tuillation, 161. The cause of it, *ibid.* In-
 duceth laughing, *ibid.* Of the Nostrils,
 causeth sneezing *ibid.*
 Toadstool 115
 Tobacco, 185, 203. English Tobacco, how it
 may be mended 185
 Tones, 29. Left apt to procure sleep, *the*
 Sounds, 31. The cause why *ibid.*
 Tongue sheweth readily inward Diseases 141
 Torpedo Marina 212
 Tough Bodies, 186, 181. The cause, *ibid.*
 Transmission of Spirits, 198. & in sect. Eight
 kinds of transmission of spirits, 199,
 200, 201. As of the airy parts of bodies,
ibid. Of spiritual species, *ibid.* Of spi-
 rits causing Attraction, *ibid.* Of spirits
 working by the Primitive Nature of Mat-
 ter, *ibid.* Of the spirits of the Minde of
 Man, *ibid.* Of the Influxes of the Hea-
 venly bodies, *ibid.* In operations of Sym-
 paty, *ibid.* By sympathy of individuals
ibid.
 Trees planted warm, 90. Housing of them,
 92. Heap of Flint laid at the bottom,
 helpeth the growth, 93. Shaking hurteth
 the young Tree, a grown Tree not, *ibid.*
 Cutting away of Suckers, helpeth them,
ibid. How to plant a Tree that may grow
 fair in one year, 94. Helped by boring a
 hole through the heart of the Stock, *ibid.*
 By slitting the Roots, *ibid.* By spreading
 upon a Wall, *ibid.* By plucking off some
 Leaves, *ibid.* By digging yearly about the
 Root, 95. By applying new Moulds, *ibid.*
 By removing to better Earth, *ibid.* By sti-
 cing their Bark, *ibid.* In some kinds by
 shade, *ibid.* By setting the Kernels of
 Stones in a Squil growing, *ibid.* 96. By
 pulling off some Blossoms, *ibid.* By cutting
 off the top, when they begin to bud, 97. By
 boaring them through the Trunk, and
 putting in Wedges of hot Woods, *ibid.* By
 several applications to the Roots, *ibid.* By
 Terebration again, 98. The cause thereof,
ibid. By letting them bleed, *ibid.* Grow
 best fenced from Sun and Wind, 99. Causes
 of their Barrenness, *ibid.* Helps to make
 Trees fruitful, 100. Tree blown up by the
 Roots, and replaced, proved fruitful, 95.
 Tryal of watering a Tree with warm wa-
 ter, 97. Trees that grow best without graft-
 ing, *ibid.* Fruit-tree grafted upon a moi-
 ster stock, will grow larger, 97. Trees re-
 moved to be coaxed as before, *ibid.* Lower
 Boughs bring the bigger Fruit *ibid.*
 Trees apparelled with Flowers, 108. Form-
 ing of Trees into several shapes *ibid.*
 Transmutation of Trees and Plants, 110.
 Six designations thereof *ibid.* 112, 113
 Trees in Coppice-woods grow more straight,
 113. The cause thereof *ibid.*
 Trees full of heat, grow tall, *ibid.* The cause,
ibid. How to Dwarf Trees *ibid.*
 Trees that are Winders, 113. The cause
 thereof *ibid.*
 Trees

Trees: moister yield less Moss, 114. The cause
ibid.
Trees in Clay-grounds apt to gather Moss, ibid.
The cause ibid.
Trees Hide-bound bring forth Moss ibid.
Trees that ripen latest blossom earliest 119
Trees that last longest, 120. viz. The largest
of body, ibid. Such as bring Mast or Nuts,
ibid. Such as bring forth Leaves late,
and shed them late, ibid. Such as are often
cut ibid.
Trees with scattered boughs, 121. With up-
right boughs, ibid. The cause of each
ibid.
Tree Indian with Leaves of great largeness,
and Fruit without stalks 127
Tree in Persia nourished with Salt-water
ibid. 128
Trees commonly fruitful, but each other
year 130
Trees bearing best on the lower boughs, 131.
others on the higher boughs, ibid. The
cause of each, ibid. Such as bare best when
they are old, 131. Others when they are
young, ibid. The cause of each ibid.
Trembling in shadows 190
Tryals for wholesome Airs 164
Turf of Moss on a Bryer bush 117
Turks great sitters, 156. To them, Bathing
good ibid.
Twice a year Fruits 119
Tying of the Point 192, 193
Tyranny over Mens Understandings and Be-
liefs much effected 215

V.

Vapor of Char-coal, or of Sea-coal, or of
a Room new plasted, mortal 202
Vapors which taken outwardly, would con-
dense the Spirits 203
Vegetables rotting upon the ground, a good
Compost, 223. Several instances thereof
ibid.
Venous Bodies 180
Venus, 142. In excess dimeth the sight, ibid.
The Act of it. Men more inclined in
Winter, Women in Summer 143
Vermine frighted with a Head of a Wolf
210
Vesuvius 165
Vines made fruitful by applying the Kernels
of Grapes to the Roots, 10. The cause
thereof, ibid. Made to sprout suddenly
with Nitre, 96. Love not the Colewort
110. Vine-Trees, 128, 129. Anciently
of great bodies, ibid. A rough wood dry,
ibid. Vines in some places, not propped
125

Vine grafted upon Vine 130
Vinegar 194
Violet-Vinegar 4
Visibles hitherto, the Subject of Knowledge,
26. Mingle not in the Medium as Au-
dibles do, 53. The cause thereof, ibid. Se-
veral consents of Visibles and Audibles,
58. Several Dissents of Visibles and Au-
dibles, 60, 61. Visible Species, 160. Vi-
sibles and Audibles, 204. Two lights of
the same bigness, will not make things be
seen as far again as one, 54. The cause
thereof ibid.
Visual Spirits infecting 202, 203
Vitriol 127
Vivification, 73, 74. The several things re-
quired to Vivification, 143. The Process
of it ibid. 194, 195
Ulcers in the Leg, harder to cure then in the
Head, 166. The cause, ibid. Difference of
curing them in a French-man, and an Eng-
lish man ibid.
Unbarked Branch of a Tree being set, bark
grown, 134. Bark will not ibid.
Unguentum Teli 200
Union, the force thereof in Natural Bodies,
24. Appetite of Union in Natural Bodies
64. Appeareth in three kinds of Bodies
ibid.
Voice, the shrillness thereof, 43. In whom
especially, ibid. Why changed as years of
Puberty, ibid. Labor and Intention con-
dueth much to imitate Voices, 56. Imita-
tion of Voices, as if they were at distance
ibid.
Urine in quantity, a great hinderer of Nourish-
ment 14

W.

W Armth, a special means to make ground
fruitful 123, 124
Warts taken away by Lard or an Elder stick
consuming 213
Water thickned in a Cave, 20. Changed
suddenly into Air, 24. Choice of waters,
86. By weight, ibid. By boiling, ibid. By
longest lasting, impurefied, ibid. By
making drinks stronger, ibid. By bearing
Soap, ibid. By the places where they are
congregated, 87. By the soil, ibid. Wa-
ters sweet, not to be trusted, ibid. Well-
water, ibid. Water putteth forth Herbs
without Root, 117. Water alone will
cause Plants to sprout, ibid. Well water
warmer in Winter then in Summer, 191.
Water rising in a Bason by means of Flames
192
Water hot, and Fire, heat differently, 104
Water

His Majesty's Receipt for the Count (to which the
 Majesty's Exchequer hath referred) was this

To be taken in this order.

By the Receipt

Received of the Count of the Countess of Devon
 the sum of one hundred and fifty pounds
 for the purchase of a new coat of arms
 for the Countess of Devon

Witness my hand and seal at the City of London
 the 10th day of March 1666

By the Receipt of the Countess of Devon
 the sum of one hundred and fifty pounds
 for the purchase of a new coat of arms
 for the Countess of Devon

THE
NOVUM
ORGANVM

OF

Sir FRANCIS BACON,

BARON of VERULAM,

Viscount *St. Albans.*

EPITOMIZ'D.

For a clearer understanding of his

NATURAL HISTORY.

Translated and taken out of the Latine
by M. D. B. D.



LONDON,

Printed for *Thomas Lee* at the *Turks-head*
in *Fleetstreet.* 1676.

THE
MOVING
ORGAN

OF

FRANCIS BACON

BARON OF VERULAM

BY

LICENS'D

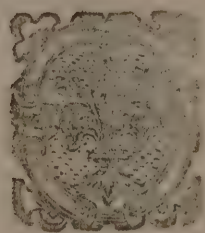
MATTHEW HART

Jan. 26. 1675.

Roger L'Estrange

Printed and sold one of the Station

by W. D. B. D.



LONDON

Printed by Thomas Lee at the Treflehead

in the Strand. 1676.



THE
P R E F A C E
TO THE
R E A D E R.



Need not recommend to your perusal this useful Treatise, seeing that it proceeds from such a Genius, whose most trivial conceptions have obtained the esteem of his Age, not inferior in Learning to any of the former. He was a person of a sound judgement, sharp wit, vast comprehension, and of extraordinary abilities both natural and acquired. But I need not run over the praises of a person so well known amongst us to oblige my Reader to a kind reception; and favourable interpretation of this obscure, but useful Book: For the things therein contained are so excellent in themselves, and so well designed, that we may be inclinable of our own accord to embrace and peruse them.

The Authors purpose, as you may perceive, is to censure the limitations of Sciences to the bounds prescribed to us, by the shallow pates of some of former Ages, to discover the mistakes of our understandings, to point at the sources from whence they proceed, to rectifie the common errors of men, backed by ill grounded Axioms, to direct us to a right interpretation of Nature's Mysteries, and oblige us to settle our judgements, upon better and sounder principles than ordinary; his purpose is to open to us a Gate to a greater Proficiency and improvement in all kind of Learning, to pull down the Walls of Partition, and remove the Non plus ultra, that we might sail to those Indies full of Gold and Jewels. I mean the Sciences not yet discovered to our World, and fetch from thence all the Rarities, the Knowledges, and Inventions, that might pleasure and benefit our humane life. For that purpose he adviseth us not to take things and notions too much upon Trust, but to ground our belief upon Practice, and well ordered experience. He layes down several Principles, which may seem strange and new; but if they be rightly examined, we shall find them naturally proceeding from the nature of things. I confess the most excellent conceptions are wrapped up in obscure terms, and in such new contrived expressions, that King James at the first perusal judged this Novum Organum to be past all Mans understanding. But we may con-

To the Reader.

sider, that a new Method, and new Things and Principles deserve new expressions, and that our learned Author speaks not to the Vulgar, but unto the Learned, unto whom he discovers other Lands never found out before, and adviseth them to adventure, to seek and to proceed on without minding the discouragements and prohibitions of our Predecessors in Learning.

This Treatise therefore was looked upon as a seasonable Addition to his Natural History, but because the whole would have made it too voluminous, I have been desired to gather out such Observations and Directions as might be answerable to that subject. I must needs confess, after a serious perusal, I did scarce know what was to be set aside; for all the things things therein contained, are so material and seasonable, that I have wondred, that our English Curiosi have not had the desire to study and understand the directions that are there given to undeceive their mistaken Judgements. In such a Case, that this *Novum Organum* might be the better intelligible, a meer interpretation is not sufficient, in regard of the Authors difficult and new found expressions, a Comment would be required, which if it were well and judiciously composed according to the Authors true meaning and intent, I am perswaded every one would be of my Judgement, that it is the best and most useful Treatise of our Dayes for the purpose that is designed. I am perswaded that it might be of a singular use to such Vertuosi amongst us, as are not perfectly acquainted with the Latine Tongue, and yet imploy their Time and Studies in the improvement of their abilities, and finding out inventions useful to the Life of Man, for it would supply them with such principles as their leasure and contrivance might wonderfully improve in new discoveries.

I was sorry that my Pen was limited to so few sheets, and that I had not the liberty to make the whole Organum appear in our Language. For brevity sake therefore I have in some places shortened the Authors expressions. However this will be sufficient to give a taste of the whole, which such as understand the Language of the Learned may peruse at their leasure, Vale.

M. D.

Part



Part of the
Novum Organum,
 OR,
A P H O R I S M S
 OF THE
 Interpretation of NATURE and KING-
 DOME of MAN.

Taken out of the First Book.



A N, Natures Minister and Interpreter, acts and understands only so much of the ordering of Nature, as he hath observed by the assistance of Experience and Reason: more he neither doth, nor can apprehend.

Neither the Hand alone, nor an Understanding left to it self, can do much. Things are performed by instruments and helps, which the Understanding needs as much as the Hand. Now as Mechanick Instruments assist and govern the Hands motion, likewise the instruments of the Understanding prompt and advise it.

Humane Knowledge and Power are co-incident in the same, or happen to be alike, because ignorance of the Cause renders the Effect unintelligible: for Nature is not overcome without submission, and that, which in Contemplation stands instead of the Cause, in Operation serves as a Rule.

As to Operation, Man can do no more but only apply or remove natural Bodies. The rest Nature willingly compleats.

The Mechanick, the Mathematician, the Physitian, the Chymist, and the Magician are variouly concerned in natural Operations; but as it happens at present their attempts are but slight, and their successes inconsiderable.

It were an extravagancy, and a plain contradiction to expect the accomplishment of those things, which were never yet done unless by means never yet attempted.

B

Even

Even those Operations which are found out are rather to be ascribed to Chance and Experience than to Sciences; for the Sciences, which are now professed amongst us, are nothing else, but an adorning and a setting forth of things formerly invented, not the modes of Invention or the desigments of new Operation.

The Cause and Origine almost of all the Mischiefs, that happen in Sciences, is this alone, that we too much admire and set up the strength and power of our understanding, and we neglect the true helps and aids thereof.

Natures subtilty far exceeds the subtilty of our Sense, or that of our Understanding; so that the delicate meditations of Mankind, their speculations and inventions are but foolish things, if they were narrowly searched into.

As Sciences commonly so called are unprofitable for the invention of Operations, so the Logick now in use is not conducible to the finding out of true Sciences.

The Logick, which we now use tends to the establishment and confirmation of Errors, which are founded in vulgar notions rather than to a serious enquiry after Truth, therefore it is more hurtful than profitable.

A Syllogisme is not used amongst the principles of Sciences, and in medical axioms it is employed in vain, for it falls much short of Natures subtilty. It hath therefore a command over assent, not over the things themselves.

A Syllogisme consists of Propositions, Propositions of Words, Words interpret Notions, therefore if Notions, the basis of Things be confus'd, and rashly abstracted from things, nothing will be firm that is built upon them, therefore our only assurance is in a right induction.

There is no soundness in Logical and Physical Notions, neither substance, nor quality, action, passion, nor being it self, are proper Notions, much less heavy, light, thick, thin, moist, dry, generation, corruption to attract, to expel element, matter, form, &c. All these are phantastical and ill designed.

The Notions of the lower Species, as a man, a dog, a dove, and the immediate apprehensions of our senses; namely, hot, cold, white, black, don't much deceive us, and yet nevertheless by the fluidity of matter and mixture of things they are sometimes confounded. All other Notions, which men have hitherto used are aberrations, and are neither duely nor truly abstracted, and raised from the very things themselves.

The things that are already invented in Sciences, are such as most commonly depend on vulgar Notions. If any will search into the more inward, and remote mysteries of Nature, he must make use of Notions and Axioms, abstracted from things in a more certain and solid manner, that the working of the Understanding may be better and surer.

There are and may be two ways of searching and finding out truth: one from Sense and particulars leads to the most general Axioms, and out of those Principles and their unquestionable Authority judges and finds out middle Axioms. This way is much in use. The other raiseth Axioms from Sense, and particulars by a continual and gradual ascent it proceeds at last to generals. This is a true way but not yet attempted.

The Understanding left to it self goes the former way, observing a Logical method; for the mind delights to leap to generals, that it might acquiesce there, and after a little stay it loaths Experience. But these evils

evils are now at length augmented by Logick for the pomp of disputations.

An Understanding left to it self, accompanied with sober, patient, and grave Wit, if not hindred by former precepts, essays the other way, which is right but not successful; because when the Understanding is not directed and assisted, is but weak, and unable to overcome the obscurity of things.

Either way derives its beginning from sense and particulars, and acquiesces in things most general. But yet they differ very much, for the one does lightly run over experience and particulars; the other converses in them in a right and methodical manner. Again the one layes down at first, certain abstract and unprofitable generals. The other rises by degrees to these things, which indeed are more known to Nature.

It can never be that Axioms framed by arguing, for finding out new Operations, should be of any value, because the subtilty of Nature doth far surprise the acuteness of disputation. But Axioms rightly abstracted in order from particulars, do easily discover and shew forth other new particulars, and therefore by that means Sciences became active.

The Axioms now in use sprang from small and slender experience, and a few common particulars, they are for the most part made and enlarged according to their measure, so that it is no wonder, if they lead not to new particulars. Now if by chance any instance not observed or known before, offer it self, the Axiome is saved by some frivolous distinction; whereas it is more proper, that the Axiom it self should be mended.

That humane reason, which we use in Natures assistance, we are wont to call anticipations of Nature, because it is rash and hasty. But that reason, which is rightly extracted out of things, we call interpretation of Nature.

Anticipations are strong enough to gain consent, seeing that if all men were equally and conformably made, they would agree well enough among themselves. To speak plainly, no right judgement can be made of our way, nor of those things which are found out agreeable unto it by anticipations, I mean by the reason now in use: because we cannot desire any one to stand to the judgement of that thing which is it self called in question.

It is no easie matter to deliver, or explain those things which we have produc'd; because things new in themselves are to be understood by the Analogy they have with old ones.

Borguas tells us of the French Expedition into Italy, that they came with chalk in their hands to mark out their Inns, and not with arms to break through them. Our design is the same, that our doctrines might be admitted by well disposed and capacious Souls, for there is no need of confutations, where we disagree in the very principles, notions, and forms of demonstration.

Their reason, who held *non-comprehension*, and our way do in some sort agree in the beginning, but they vastly differ and are opposite in the end, for they absolutely affirm, that nothing can be known, but we say not much can be known in Nature, in that way as it is now handled. They by their assertion destroy the authority of Sense and Understanding, we study and give remedies to help them.

Idols, mistakes, and mis-apprehensions, which now possesse, and are deeply rooted in Mans Understanding, so besiege the minds of Men that

Truth can hardly get admission, but if it should they would hinder and disturb the restoration of Sciences, unless Men being fore warned would arm themselves against them, as much as they could.

There are four sorts of Idols or false Images, which besiege Mens minds: we, for distinction sake, have called them first *Idola Tribus*. 2. *Idola Specus*. 3. *Idola Fori*. 4. *Idola Theatri*.

The raising Notions and Axioms by true induction is doubtless a proper remedy to drive away and remove these Idols, yet their indication is of great use, for the doctrine of Idols conduces to the interpretation of Nature; even as the doctrine of Sophistical arguments doth to vulgar Logic.

Idola Tribus are founded in humane Nature it self, and in every Family and Stock of Mankind. For humane sense is safely affirm'd to be the measure of things. On the contrary, all the conceptions both of sense and reason are taken from the analogy of Man, not the analogy of the Universe. Humane Understanding is like an unequal looking-glass to the rayes of things, which mixing its own Nature with the Nature of things, doth wrest and infect it.

Idola specus are the mis-apprehensions of every individual Man. For every one hath besides the mistakes of humane Nature in general, a den or individual cave, where the light of Nature is obscured and corrupted. This happens either through every Mans singularity, or through education and conversation among others, or by reading of Books and the authorities of them who are honoured and admired by every one, or through the different impressions which occur in a prepossessed and predisposed, or in a calm and equal mind, or the like: so that the Spirit of man, as it is placed or qualified in every Man, is a various, a troubled, and a fortuitous thing; wherefore *Heraclitus* said well, that men sought after Sciences in lesser worlds, and not in the great and common World.

There are also Idols or mis-apprehensions arising from the mutual contracts, and also ciations of Men, which by reason of humane commerce and society we call *Idola Fori*: For Men are associated by speech, but words are imposed according to the vulgar capacity; therefore a vitious and an improper imposition of words doth wonderfully mislead and clog the Understanding. Neither the definitions and explications, wherewith learned men are wont to defend and vindicate themselves in some things, do mend the matter for words, do plainly force the Understanding and disturb all things, they lead men into many idle controversies and foolish inventions.

Lastly there are Idols or misapprehensions, which are entered into Mens minds from divers opinions of the Philosophers, as also from the perverse Laws of demonstrations: these we call *Idola Theatri*. Because all the kinds of Philosophy, which have been invented and received we look upon as so many Fables produced and acted to make fictitious and senicall Worlds. Neither speak we of those amongst us, or only of the ancient Philosophers and Sects; seeing many the like Fables may be composed and made, because the causes of the different errors are for the most part common; neither do we understand this only of universal Philosophy, but also of many Principles and Axioms of Sciences which have prevailed by tradition, credulity and neglect. But of all these kinds of Idols we must speak more largely and distinctly, that so the humane intellect may take more heed.

Humane Understanding is inclinable of it self to suppose a greater order and equality in things than it finds. And whereas many things in Nature are monodical and altogether unlike, yet it appropriates to them parallels, correspondencies, and relatives, which are not from hence, are derived those Figments.

In Cæstiaal Bodies all things are moved by perfect Circles. In the meantime they reject Spiral and Serpentine lines, retaining yet the names: From hence it is, that the Element of Fire is introduced to make a quaternion with the other three, which are within the reach of our senses. To the Elements also, as they call them, fancy ascribes to them a double proportion of excess in their mutual rarefaction, and such like dreames are invented. Nor is this vanity predominant in opinions only, but also in simple notions.

The Humane Understanding attracts all other things to give its suffrage and consent unto those things which once please it, either because they are received and believed, or because they delight. And though a greater strength and number of contrary instances occur, yet it doth either not observe, or condemn them, or remove, or reject them by a distinction not without great and dangerous prejudice, by which an inviolable authority remains in those former conceptions. Therefore he gave a right answer, who, when a list of the Names of such as had paid there their vows for escaping the danger of Shipwrack, was shewn to him hung up in a Temple, and when he was questioned whether he did not acknowledge the Deity of the gods? He in answer demanded what was become of their pictures who had perished after that they had paid their Vows? There is almost the same reason for all Superstition, as in Astrological dreams, presages, &c. Men delight in such vanities, they mind the events when they come to pass, but when they fail, which is very often, they neglect and pass them by. But this evil more subtilly invades Philosophy and Sciences, wherein that which once takes, infects and corrupts the rest, though more firm and better. But in case this delight and vanity were wanting, yet it is a proper and perpetual error in Humane Understanding, to be rather moved and stirred up by affirmatives than by negatives, although in truth it ought to be indifferent to both: Yet on the other hand the strength of a negative Instance is greater in constituting every Axiom.

Humane Understanding is for the most part moved with those things, which suddenly and at once effect and reach the mind, and wherewith the fancy is wont to be filled and puffed up. As for the rest it supposes and fancies to have them in a kind of inperceptible manner, even like those few things that possess the mind. But as to that quick running over remote and heterogeneous instances, whereby Axioms are tried as it were by fire, the Understanding is altogether slow and unable, unless severe Laws and violent commands be imposed upon it.

Humane Understanding cannot rest, but still desires more and more, though all in vain. Therefore it is not to be imagined that Heaven should hear any extream or extime parts; for it may be alwayes necessarily urged, that there is something further. Again it cannot be conceived how Eternity hath run along until now, because there is a common distinction usually admitted, that it is infinite *a parte ante* & *a parte post*, which can in no wise be proved, for then it would follow that one infinite is greater than another, and that an infinite consumeth and tends to a finite. The like nicety occurs through the weakness of our imagination concerning

ning lines alwayes divisible, but this mental infinity more dangerously interposes in the invention of causes : For whereas Universals chiefly ought to be in a positive nature, as they are found out, being not really causable, yet the Humane Understanding being unable to rest, still desires things more known, but whiles it tends to further things it falls back to nearer ones, viz. Final causes, which indeed arise rather from Humane Nature, than the nature of the Universe. Out of this Fountain Philosophy is strangely corrupted. But he is equally an unskilful and a slight Philosopher, who seeks out a cause in primary universals, as he who desires it not in subordinate and subaltern things.

Humane Understanding is not an *Ignis fatuus* a meer light, but it receives an impression from the Will and the Affections, which produces the reason why it desires Sciences, for what a Man had rather have true, that he resolves to believe. Therefore he rejects difficult things, through impatency of inquiry; sober things, because they confine the hope; the high Mystery of Nature, because of our natural Superstition; the light of experience, because of an arrogancy and pride, lest the mind should seem to converse in vile and transitory affairs, he rejects Paradoxes being too much over-ruled by the mistakes of the vulgar. Lastly affection qualifies and infects the Soul many wayes which cannot be conceived.

But the greatest hinderance of the Humane Understanding, and its most dangerous errors proceed from the dulness, unsufficiency, and deceptions of the senses : those things which make impressions on the senses are of a greater weight than others of a higher nature, that do not affect them : Therefore contemplation most commonly ends with the sight, insomuch that there is little or no observation made of invisible things. Therefore the actions of the Spirits shut up in sensible bodies are hid from us. And all subtil transformation, that happens in the parts of the grosser things, which we commonly stile alteration, but is in Truch a subtil metaschematism escapes also our knowledge. Nevertheless, if these two that we have named be not found out, there can be no great matter performed in the works of nature.

Again the nature of common air, and of all Bodies which in thinness surpass the air, they being many in number are almost unknown, for sense in it self is a weak and an erroneous thing, nor do the Organs conduce much to enlarge or sharpen the senses, but the truest interpretation of Nature is made by instances, and by fit and proper experiments, when sense judges of the experiment, the experiment of Nature, and of the thing it self.

The Humane intellect is by its own Nature carried on to abstracts, and those things which are unstable it fancies to be constant.

But it is better to dissect Nature than abstract her, which was done by *Democritus's* School. By that means he searched further than the rest into Nature. For that purpose we must rather examine matter, its schemes and transformations, its pure acts and the Law of action and motion. Forms are but the invention of mens brains, unless you will call the Laws of the act forms.

Of this kind are those false imaginations, which we call *Idola Tribus*, they proceed, either from the equality of the substance of the humane Spirits or the prepossessions, coarctations, and turbulent motions thereof, or from the inspirations of the passions, or disagreement of the senses, or the manner of impression,

Idola Specus proceed from the proper nature of every individual mind or body, as also from education, custome or other casualties, which kind though various and manifold, yet more especially we propound those which require most caution, and have greatest power to defile the Understanding, and render it impure: contemplations of Nature and most simple Bodies only disturb and impair the Understanding, but contemplation of Nature and of Bodies compound, and in their configuration astonish and dissolve the intellect. This is most evident in the School of *Hencippus* and *Democritus* compared with other Philosophy, for it so much considers the particles of things, that it almost neglects their frames: and others so amazedly behold them, that they cannot arrive to Natures simplicity. These contemplations therefore are to be altered and interchangeably assumed, that the Understanding at the same time, may be made penetrating and capable, and those inconveniencies we speak of be avoided with the false notions proceeding from them.

Let therefore your speculative prudence be so disposed in expelling and removing the *Idola Specus*, which proceed either from the predominancy, or excess of composition and division, or from our affection to the times, or from large and small Objects. In general let every one, who studies the nature of things, chiefly suspect that which captivates his Understanding, and so much the greater heed is to be taken in these opinions, that the Understanding may be kept equal and pure.

But *Idola Fori* are the most troublesome of all, which, by a confederacy of words and names, have insinuated themselves into the Understanding. For men believe that their Reason governs words, but so it happens that words retort and reflect their power upon the Understanding. This hath made Philosophy and Sciences Sophistical and unactive. Now words are for the most part accommodated to vulgar capacities, and by lines most apparent to common apprehensions they divide things. But when a sharper intellect, or more diligent observation would transfer those lines, that they might be more agreeable to Nature; words make a noise: from hence it comes to pass, that the great and solemn disputations of learned men, often end in controversies concerning words and names, with which, according to the custome and prudence of Mathematicians twere a wiser way to begin, and to reduce them into order by definitions. And yet definitions in natural and material beings cannot remedy this evil because they also consist of words, and words beget words, so that it is necessary to have recourse to perticular instances, and their ranks and orders, as we shall presently shew, when we come to the manner and reason of constituting notions and Axioms.

Mis-apprehensions forced by words upon the Understanding are of two sorts. 1. The names of things which are not: for as there are things which through inadvertency wanting a name, so are there names without things, through a Phantastical supposition. 2. Or the names of things which are but confused, ill determined, rashly, and unequally abstracted from things. Of the first sort are Fortune, the *Primum Mobile*, the Planetary Orbs, the Element of Fire, and such like fictions arising from vain and false speculations. This kind is easier cast out, because it is exterminable by a continued abnegation and antiquation of such speculations. But the other sort is perplex'd and deeply rooted, proceeding from an ill and unskilful abstraction. For example sake, take any word, *Humidum* if you please, and let us see how its various significations agree, and we shall

shall find this word *Humidum* to be nothing else but a confused note of divers actions enduring no constancy or reduction; for it signifies that which easily circumfunds it self about another body, and is in it self indeterminable and inconsistent, that which easily gives place on all sides, and easily divides and dissipates, and as easily collects, and reunites it self, that which easily flowes and moves, easily adheres to another body and moistens it, that which is easily reduced into a liquid, or melts, having been before consistent or solid: Therefore if you consider the predication and imposition of this word taken in one sense the Flame is moist, in another sense the Air is not moist. In one sense again small dust is moist, in another glass is so. Whence it is evident, that this notion was only rashly abstracted from waters and common liquors without any due verification.

In words also there are certain degrees of pravity and error, less vitious are the names of some substances, especially the lowest Species well deduced, for the notion of Chalk and Clay is good, the notion of Earth bad, more vitious are the actions of Generation, Corruption, Alteration: The most vitious qualities, except the immediate objects of sense, are heavy, light, rare, dense, &c. And yet even among these it cannot be helped but some notions will be better than others, accordingly as more copious matter supplies Humane sense.

The other mistakes named *Idola Theatri*, are not innate, nor secretly wrought in the Understanding, but by fabulous speculations, and the perverse Laws of demonstrations plainly infused and received. But in these to undertake or endeavour a confutation is not agreeable to what we have spoken. For seeing that we neither agree in our principles nor demonstrations all disputation is taken away. But this is good luck for the Ancients, that they may preserve their reputation, for nothing is detracted from them, seeing the way is so questionable. Because a lame Man, as they say, in the way, out goes a Racer out of the way, for tis evident the stronger and nimbler he is, the greater is his aberration, whiles he is out of the way.

But such is our manner of inventing Sciences, that we attribute not much to the sharpness and strength of wit, and yet we almost equalize them, for even as the describing of a right line or perfect Circle much depends on the steadiness and exercise of the hand, if it be done meerly by the hand; but if a rule or compasses be used, there is little or no such dependancy upon the hand: So fares it exactly with our Reason. Although there be no particular use of confutations, yet we must say something of the Sects and Kinds of these Theories, and afterwards of their outward signs, because they are in a bad condition, and lastly of the causes of so much unhappiness, and so long and general a consent in error, that Truth may have an easier access, and the Humane Understanding may be more thoroughly purged, and rid of these mistakes.

Idola Theatri or theoretical mistakes are many, and may be more, and in time to come will be, for unless mens wits had been employed about Religion and Divinity during many Ages, and also about civil Governments, especially Monarchies, they had detested such novelties in contemplations. So that Men addicted unto them, ran the hazard of their fortunes, not only deprived of a reward, but also exposed to contempt and envy. Doubtless many more Sects of Philosophy, and Theories like to those, which once in great varieties flourished amongst the Grecians, had

had been introduced : for as upon the etherial *Phænomena's* more figures of Heaven may be formed, likewise many more various opinions may be as easily founded and established upon the *Phænomena's* of Philosophy : Now the Fables of this Theater are like those that are acted on the poetical Stage, whence it comes to pass, that Scenical and feigned narrations are more quaint and elegant than those taken out of true history, and better please the Readers.

In general either much out of little, or little out of much is assumed into Philosophical matter, so that on all sides, Philosophy is founded on the too narrow basis of experience, and Natural History, and determines out of fewer things than it ought ; for the rational sort of Philosophers snatch from experience several vulgar things, and they to neither certainly found out, nor diligently examined or tried, the rest they place in meditation, and the exercise of wit.

There is another sort of Philosophers, who have bestowed a great deal of pains in few experiments, and from thence have presumed to draw and frame a Philosophy strangely wresting all other things thereunto.

There is also a third sort of them, who intermingle divinity, and traditions of Faith and Adoration amongst whom the vanity of some has inclined them to seek and derive Sciences from Spirits and Demons. Therefore the stock of Errours and false Philosophy is threefold, namely Sophistical, Emperical, and Superstitious.

Of the first kind *Aristotle* is an evident Example. By his Logick he corrupted natural Philosophy made the world consist of Categories attributed to the humane Soul, a most noble substance, a genus made up of secondary notions, transacted the business of dense and rare, whereby bodies under go greater or lesser dimensions or spaces by the cold distinction of act and power. He asserted only one proper motion to be in all bodies, and if they had any other, that he said was from another ; many more things he affirmed according to his fancy, which he imposed upon Nature, being every where more solicitous how he might explain himself in answers, and make any thing positive in words, than of the internal truth of things. This plainly appears if you compare his Philosophy with others famous amongst the Grecians, for the *Homoiomera* of *Anaxagoras*, the Atoms of *Leucippus*, and *Democritus*, the Heaven and Earth of *Parmenides*, the discord and concord of *Empedocles*, *Heraclitus's* resolution of Bodies into the adiabourous nature of Fire, and the replication of them to density, have something of natural Philosophy in them, and a relish of nature and experience : whereas *Aristotles* Physicks are nothing but logical notions, which under a more specious name, not nominal but more real he retracts in his Metaphysicks, nor let not that move any one, that in his Books of Animals, in his Problems and other Treatises he frequently useth Experiments. For he first decreed them, neither did he rightly consult experience in establishing his Determinations and Axioms, but after he had determined them according to his pleasure, he made experience a slave to his fancies : And upon this account he is more to be blamed than his modern Followers, I mean a Sect of Scholastical Philosophers, who have altogether forsaken experiments.

But the Emperical kind of Philosophy brings forth more deformed and monstrous opinions than the Sophistical or rational, because it is not founded in the light of common notions, which though slender and superficial is notwithstanding in some measure universal and conducive to

many things, but in a few narrow and obscure experiments. And therefore to those who daily converse in such experiments, and have thereby corrupted their fancy, this Philosophy seems probable and certain, but to others incredible and vain. A notable example whereof we find in the Chymists and their opinions, but now scarcely any where else, unless in *Gilberts* Philosophy. However we must by no means omit a caution concerning this Philosophy, because we inwardly foresee and presage that if men awakened by our precepts, shall at last betake themselves to experience, bidding adieu to Sophistical doctrines, they will sustain some damage, through a premature and inconsiderate haste of the understanding, by soaring too soon to generals and principles, which evil we ought to prevent.

But the corruption of Philosophy through superstition and intermixed Divinity extends it self further, and works much mischief, both to Philosophy in general and particular. For the humane understanding is no less obnoxious to the impressions of Fancy, than to the impressions of vulgar notions. For the contentious and Fallacious kind of Philosophy ensnares the Understanding, but the other kind being phantastical, swollen and Poetical doth rather flatter it. For there is in Man a certain ambition of the Understanding as well as in the Will, especially in sublime and elevated Wits. Of this kind you have an example amongst the Grecians, especially in *Pythagoras*, but joyned with gross superstition, but more dangerously and subtilly in *Plato*, and his School. This kind of evil is found in the parts of other Philosophers; by the introduction of abstract Formes, final Causes, first Causes, and frequent omitting the medial, and the like. Wherefore take great heed to this matter, for it is the worst of evils to deifie errors, and to adore vain things may be well accounted the plague of the Understanding.

Some modern Men guilty of much levity, have so indulged this vanity, that they have essayed to found natural Philosophy in the first Chapter of *Genesis*, the Book of *Job*, and other places of Holy Writ, seeking the living among the dead. Now this vanity is so much the more to be check'd and restrained, because by unadvised mixture of divine and humane things, not only a phantastical Philosophy is produced, but also an Heretical Religion. Therefore it is safe to give unto Faith with a sober mind, the things that are Faiths.

Hitherto our Excellent Author hath spoken of the bad authority of Philosophy, founded in vulgar notions, a few Experiments, or in Superstition: he examines next the depraved matter of Contemplation especially in natural Philosophy.

He proceeds next to discover to us by what means demonstrations lead us into errors and mistakes, and concludes that experience is the best demonstration, if it be founded upon mature Experiments. He discourses afterwards of the several sorts of Philosophers among the Greeks, and takes notice of their imperfections, of their ignorance in ancient History, and in Cosmography, so that they could not be acquainted with so many experiments, as the Learned of our dayes.

Afterwards he discourseth of the causes of Errors, and of their long continuance in credit in the World, that none might wonder how it comes to pass that some in these last Ages, find so many mistakes in the Learning and Wit admired in former Ages.

The first Cause of the small proficiency in Sciences, he saith, is the streights of time; and their ignorance of former Times: for their Observation had not scope enough, nor sufficient assistance from true History, to gather right and judicious Experiments.

*In the second place another Cause of great moment certainly offers it self; namely that in those times, when the wits of men and Learning flourished most or but indifferently, Natural Philosophy had the least share in humane contemplations: nevertheless this ought to be accounted the great Mother of Sciences: for all Arts and Sciences, pluck'd away from this Root, may perhaps be polished and accommodated to use, but they will never grow. Now it is evident, that since the Christian Faith was embrac'd and encreas'd the most part of the rarest Wits applied themselves to Divinity. To this end large rewards were propounded, and all manner of helps plentifully afforded. This study of Divinity took up the third part or period of time amongst us Europeans, and the more because about that time Learning began to flourish, controversies touching Religion did wonderfully increase: but in the preceding Age, during the second period among the Romans, the chiefest meditations and studies of Philosophers were imployed and spent in Moral Philosophy, which was then the Heathens Divinity. Moreover the greatest Wits in those dayes for the most part applied themselves to Civil affairs, by reason of the Roman Empires greatness, which required the labours of many men. But that Age wherein Natural Philosophy seem'd chiefly to flourish among the Grecians was a parcel of time of small continuance, for even in ancienter times, those Seven, called Wisemen, all except *Thales*, applied themselves to Moral Philosophy and Politicks. And in after times, when *Iso-crates* had brought down Philosophy from Heaven upon Earth, Moral Philosophy prevailed further still, and diverted mens thoughts from physiological speculations.*

That very period of time also, wherein Physick Enquiries flourished was corrupted and spoiled with contradictions, and new determinations. Wherefore Natural Philosophy in every one of those periods, being greatly neglected or hindred, 'tis no wonder men profited so little in it, seeing they altogether minded other things.

Add moreover, that those who studied Natural Philosophy, especially in these modern times, did not wholly addict themselves thereunto, unless, perhaps you may alledge the example of some Monk in his Cell, or Nobleman in his Country House. So at length it was made but a passage and draw-bridge to other things.

This, this famous Mother of Sciences, was basely thrust down into servile offices, and made a drudge to wait upon Medicine, or the Mathematicks; and again to wash the immature wits of young men, and give them a superficial mixture, that they might afterwards be the better qualified to receive of another. In the mean while let no man expect a great progress in Sciences, especially in the practical part, unless natural Philosophy be produced to particular Sciences, and those again reduced to Natural Philosophy: for hence it comes to pass, that Astronomy, Opticks, Musick, many Mechanichal Arts, Physick it self, and what is more wonderful, even Moral Philosophy, Politicks, and Logick, have for the most part no considerable depth, but languish in the surface and variety of things, because when once these particular Sciences are divided, they are no longer nourished by Natural Philosophy, which out of the Fountains

and true contemplations of motions, rayes, sounds; texture and figuration of Bodies, affections, and intellectual apprehensions; communicates new strength and augmentation to them. And therefore 'tis no wonder, that Sciences grow not since they are separated from their roots. Another great and powerful cause, why Sciences are so little advanced, is this, that race cannot rightly be run, where the Goal is not rightly placed and fixed. Now the true and legitimate mark of Sciences is to enrich Mans life with new inventions and forces. But the greater number of men know nothing of this, because they are mercenary and professory, unless it happens that some Artist of a sharper wit, and ambitious of Glory, studies some new inventions, which commonly tends to his own undoing. Therefore most Men are so far from propounding to themselves the advancement of Arts and Sciences, that even out of those things that they have, they seek no more than what may be converted into professory use, gain, reputation, or the like advantages. And if any one amongst the multitude seeks knowledge ingeniously and for it self, yet you will find he doth this rather to obtain variety of contemplations and precepts, than for the rigid and severe inquiry of Truth. Again suppose another more severely enquires after Truth, yet even he propounds to himself such conditions of Truth as may satisfie his mind and understanding in reference to the causes of things known long ago, not those which may give fresh pledges of operations or new light to Axioms. The end therefore of Sciences being not yet rightly defined, or well assigned by any body, no wonder if Error and mistakes attend those things which are subordinate thereunto.

The Noble Author condemns next the erronons wayes which conduct to Sciences; namely obscure Traditions, giddy Arguments, the windings of Chance or unclean Experience; and wonders that none yet have recommended sense, and well ordered Experience, which he supposes to be partly caused by a great mistake. That the Majesty of Humane Understanding is impaired with long conversing in Experiments and particular things, subject to fence, and determined to matter; especially seeing these things are laborious in the inquiry, ignoble in the meditation, harsh in discourse, illiberal in the practice, infinite in number, and full of subtilty.

Again the reverence of Antiquity, and the authority and consent of those who have been accounted great men in Philosophy, has detained and inchaunted men from making any progress in Sciences.

As for Antiquity the opinion which men entertain of it, is idle and incongruous to the word it self, for the old age, and great age of the world are terms equivolent to antiquity, and ought to be attributed to our times, not to the youthful age of the world, that wherein the Ancients lived.

For that Age in respect of ours was greater and ancients, in respect of the World it self, lesser and younger: and therefore in like manner, as we expect a greater knowledge in Humane Affairs, a more mature and a riper judgement from an Old Man than from a Young Man, by reason of his Experience, and the variety and plenty of things which he hath seen, heard, observed, and understood, so also far greater matters may rationally be expected from our Age, than from the ancient times, if it would but know its strength, and were willing to try and mind things, because we live in the Worlds old Age, and are stored with infinite experiments, and advanced in our noble Observations. *The discoveries of other Lands*

unknown

unknown to former Ages are no small helps to our experience. Besides it is a great weakness to attribute so much to ancient Authors, for Truth is the Daughter of Time not of Authority, and the ancientest times are the youngest in respect of the World. The other cause of mens mistakes is their admiring the operations which can shew grey hairs, and a too great esteem of liberal Arts and Learning already found out, which is an act of simplicity and childishness. But the greatest damage hath happened to Sciences through pusillanimity; and the smallness of those tasks, which humane Industry hath proposed to it self, and yet, what is worst of all, that pusillanimity is accompanied with Arrogance and disdain.

Moreover Natural Philosophy in all Ages hath had a troublesome and harsh Enemy; namely Superstition, and a blind immoderate zeal of Religion.

Lastly the way to all Reformed Philosophy hath been blocked up by the unskilfulness of some Divines, who were afraid least a deeper enquiry should dive into Nature beyond the bounds of Sobriety, traduce and falsly wrest those things, which are spoken of Divine Mysteries in the sacred Writings, against Searchers of divine Secrets: Others cunningly conceive, if the means be unknown, which they think greatly concerns Religion, all things may more easily be referred to the deity. Others from their example fear least motions and mutations in Philosophy should terminate in Religion.

Again all things in the manners and institutions of Schools, Universities, Colledges, and the like places destinated for learned Men, and getting Learning, are found to be against the advancement of Sciences, &c.

But the greatest Obstacle in the progress of Sciences, and new undertakings thereof is discerned in the despairing of men, and a supposed impossibility; for even wise and grave men are wont to diffide in these things, pondering with themselves the obscurity of Nature, shortness of Life, deception of the Sences, weakness of judgement, difficulty of Experiments, and the like, &c.

We must take our beginnings from God, in what we are about, for the excellent nature of Good therein it manifestly from God, who is the Author of Good, and Father of Lights.

The Foundations of Experience, for we must descend to them, have hitherto been either none at all or very weak; neither hath a sufficient System of particulars been any wayes as yet found out and congested, either in number, kind, or certainty, able to inform the understanding.

In the plenty of Mechanical Experiments, there is discovered a great want of such as assist or tend to the information of the understanding, &c.

Not onely a greater plenty of Experiments is to be sought, and procured, differing in kind from what ever was yet done. But also another method, order and process are to be introduc'd, for the continuing and promoting of Experience. For wandring Experience, guided by it self, is a meer cheat; and doth rather amaze men than inform them. But when Experience proceeds regularly, orderly, and soberly, there may be some better hope of Sciences.

Seeing there is such a great number, and as it were an Army of particulars, but so scattered and diffused, that they disgregate and confound the understanding, we can expect no good from the skirmishes, light motions, and transursions of the understanding, unless by fit, well disposed, and

and exact Tables, there be an instruction, and co-ordination of those things which appertain to the subject of our enquiry: and the mind be applied to the preparatory and digested helps of these Tables.

But when this plenty of particulars is rightly and orderly placed before our eyes we must not presently pass to the Inquisition, and Invention of new particulars or operations, or if we do we must not rest in them, &c.

We must not permit the Understanding to leap or fly from particulars to remote and general Axioms, such as are called the principles of Arts and Things, or by their constant verity to prove or discuss medial Axioms.

But then Men may hope well of Sciences, when by a true Scale, and continual not intermitted degrees, we ascend from particulars to lesser Axioms, then to medial, for some are higher than others; and lastly to universals; for the lowest Axioms differ not much from naked Experience, but the suppressive and more general which occur, are rational and abstracted, and have no solidity. The medial therefore are those true solid and lively Axioms, wherein mens fortunes and estates are placed, and above those also are those more general, if not abstracted, but truly limited by these medial or middle Axioms.

Therefore the humane understanding needs not feathers but lead and weights to hinder its leaping and flying. But this is not yet done, when it is we may have better hope of Sciences.

Now in constituting an Axiom another form of induction contrary to what was formerly, or is now used, is found out, and that not onely to prove or invent Principles, as they call them, but also lesser and medial Axioms, ye all. For that induction, which proceeds by simple enumeration, is a childish thing, and concludes precariously, being exposed to the danger of a contradictory instance. And yet most commonly it gives judgement from fewer instances than it ought, or from those onely which are at hand. But that induction which would induce to the invention and demonstration of Arts and Sciences, must separate Nature by due rejections and separations, and, after sufficient negatives, conclude upon affirmatives, which thing is not yet done, nor so much as attempted, unless by *Plato* only, who indeed, to examine definitions and Ideas, doth in some measure use this form of Induction. But for the good and lawful institution of such an induction or demonstration, many things are to be used, which never yet entered into any mortal mans heart, so that greater pains is to be taken herein than was ever yet spent in a Syllogism. Now the help of this induction is not onely to be used in finding out Axioms, but also in terminating motions, for certainly in this induction our greatest hope is placed.

Far more and better things, yea and in shorter time, are to be expected from the reason, industry, direction, and intention of men, than from chance the instinct of Animals, which hitherto have given the beginning to Inventions.

This also may be brought as an encouragement, that some things which are found out, are of that kind, that before their production it could not easily come into mans mind to imagine any thing of them, for every body despised them as impossible, as the use of Guns the invention of Silk, the Seamans needle, &c.

Therefore we hope there are in Natures bosome many secrets of excellent use, which have no alliance nor paralellism, with the things already invented

invented, but are placed out of Fancies Road, not as yet found out, which doubtless after many revolutions of Ages shall at last come forth, even as those former did. But by the way we now declare, they may speedily and suddenly be both anticipated and represented.

We must not omit another thing, which may raise up our hope. Let men reckon the infinite expence of Wit, time, and money, which they are at in things and studies of far lesser use and value, the least part whereof, were it converted to sound and solid things, would conquer all difficulty.

Had we a man among us, who would *de facto* answer Nature's Queries, the Invention of all Causes and Sciences would be the study but of a few years.

Some without doubt, when they have read over our History and Tables of Invention, may object that something is less certain, or altogether, false in our experiments, and therefore perhaps will think with himself, that our inventions are founded on false foundations, and dubious principles. But this is nothing, for such things must needs happen at first, for it is all one as though in writing or printing some one Letter or other should be misplaced, which does not usually hinder the Reader, for such errors are easily corrected by the sence, &c.

Many things also will occur in our History and Experience, first slight and common, then base and mechanical, lastly too curious, meerly speculative, and of no use, which kind of things may divert and alienate the studies of men.

Now for those things which seem common, let men consider, that they themselves are wont to do no less than refer and accommodate the causes of rare things to these which are frequently done, but of things daily happening they enquire not the causes, but take them for granted.

And therefore they inquire not into the causes of weight, coelestial rotation, heat, cold, light, hard, soft, slender, dense, liquid, consistent or solid, animate and inanimate, similar dissimilar, nor lastly Organical, but dispute and judge of other things, which happen not so frequently and familiarly by these as being evident, manifest, and received. But we, who know well enough, that no judgement can be made of rare and notable things, much less new things be brought to light without the causes of vulgar things, and the causes of causes rightly examined and found out are forced necessarily to receive the most vulgar things into our History: Furthermore we perceive nothing has hindered Philosophy more, than because things familiar and frequently happening do not stay and detain the contemplation of men, but are entertained by the by, and their causes not inquired into, so that information of unknown matters is not oftner required than attention in known things.

Now as touching the vileness and dishonesty of things, they are no less to be entertained in Natural History than the richest and most precious things, nor is Natural History thereby polluted, for the Sun does equally visit Pallaces and Sinks, and yet is not defiled. Again we do not build or dedicate a Capitol or Pyramid to the Pride of men, but we found an holy Temple for the worlds pattern in humane Understanding.

Therefore we follow our Copy for whatsoever is worthy of essence is worthy of Science, which is the image of Science, but vile things subsist as well as costly ones. Moreover, as out of some putrid matters, as musk and civet, sometimes the best odours come, even so from low and sordid in-

stances

instances sometimes excellent light and information flowes.

Before all things we have and must speak first of this thing, viz. That we now at first setting out, and for a time, seek only lociferous not fructiferous Experiments, according to the examples of Divine Creation, which only produced Light on the first day, and bestowed a whole day upon it, not intermingling with it, in that day, any material Work. If any one therefore think these things are of no use, it is all one as if he should think Light useles, because it is indeed no solid nor material being; for we may truly affirm, that the light of simple Natures being well examined and defined, is like Light which affords passage to all the secret Rooms of Operations, drawing after it all the companies and troops of Operations, and potentially comprizing the Fountains of most noble Axioms; yet in itself it is not of so great use: Thus the Elements of Letters of themselves and separately signifie nothing, neither are of any use, but yet are like the first matter in the composition, and preparation of every word. Thus the seeds of things strong in power are as to use, except in their increase of no value, and the scattered beams of Light unless they unite together, become unbeneficial to men.

Some also will doubt rather than Object, whether we speak only of Natural Philosophy, or else of other Sciences; namely, Logick, Ethicks and Politicks to be perfected according to our way. But we surely understand what we have said of all this, and as vulgar Logick, which rules things by syllogism, belongs not onely to natural, but to all Sciences. So ours, which proceeds by induction, compriseth all things; for we make an History and inventory Tables, as well of Anger, Fear, Modesty, &c. as of Politick Examples, and so of the mental motions of memory, composition and division, judgement and the rest, no less than of heat and cold, or light and vegetation, &c. But as our method of interpretation after History is prepared and ordered, doth not only behold mental motions and discourses, as common Logick, but also the nature of things. So we govern the Understanding, that it may apply it self in a perfect and apt manner to the nature of things.

But that ought by no means to be doubted, whether we desire to destroy and demolish the Philosophy, Arts, and Sciences which we use, for we on the contrary willingly allow their use, cultivation, and honour; nor do we any wayes hinder, but that those which have been in credit, may nourish disputations, adorn Orations, be used in professory employments. Lastly, like currant money, be received among men by consent. But how truly we profess this very thing, which we mention concerning our affection and good will towards allowed Sciences, our publick Writings, especially our Books of the *Advancement of Learning* declare and attest.

It remains that we now speak somewhat concerning the excellency of the End. Had we before treated of these things, our expectations probably had better succeeded, but now we are in hopes, that all prejudices being removed, these matters may perhaps be of more weight.

For though we had perfected and compleated all things, nor had called others to share in our labours, yet should we have refrained these words lest we might be thought to proclaim our own merits, but seeing the industry of others is to be sharpened, and their minds to be stirred up and inflamed, 'tis fit we put men in remembrance of some things.

First then the Introduction of noble Inventions seems to carry the greatest

test sway amongst humane actions, as former ages also have judged; for they gave divine honor to the Inventors of things, but to those who were meritorious in civil affairs, as the founders of Cities and Empires, Lawgivers, Deliverers of their Countreys from temporal evil, Destroyers of Tyranny &c. they only decreed heroick honor. *Inventions also, are the new creations, they are man's Glory, they cause him to be a God to the rest of mankind. New inventions are of a wonderful consequence as the Art of Printing, Gun-powder, and the Sea mens compass.* These three have changed the Face and State of affairs in the whole World. First, in Learning. Secondly, in Warfare. Thirdly, in Navigation.

There are three sorts of ambition, the first desires to enlarge man's own power over Countries and People, this is common and ignoble, the Second, endeavours to enlarge other mens, as our Prince's Dominions, this hath more dignity, but no less desire.

But if any one endeavours to restore and enlarge the power and dominion of mankind, over the universality of things, doubtless this ambition is sounder, and nobler than the other two: Now mans dominion over things consists onely in Arts and Sciences, for nature is not trusted, but by obedience.

It is now high time that we propound this art it self of interpreting nature, wherein though we suppose we have given most true and profitable precepts, yet we do not attribute unto it any absolute necessity or perfection, as though nothing could be done without it. For we are of opinion if men had by them a just History of Nature and Experience, and would diligently study it, and could command themselves in two things; first in putting away received opinions and notions. Secondly, in forbearing a while generals and subgenerals, they would by the proper and genuine strength of the understanding, without any art, light upon our form of interpretation; for interpretation is the true and natural work of the mind, all obstacles being first removed: But certainly our presents will make all things more ready and sure.

Nevertheless we do not affirm that nothing can be added unto them. On the contrary we, who consider the mind not only in its own faculty, but as it is united with things ought to determine, that the art of invention may grow and increase with things invented.

TABLE

Part of the
Novum Organum,
 OR,
APHORISMS
 OF THE
 Interpretation of NATURE and KING-
 DOME of MAN.

Taken out of the Second Book.



It is the business and intent of humane power to produce and superinduce a new nature, and new things upon a body given to it; but it is the business and purpose of humane science, to find out the true form of this body, or the right difference, or the essence of nature, called *natura naturans*, or the Fountain of emanation: these words we use, because they express the thing, and discover it best. Now to these works of the first rank there be two of a second and inferior sort, that are subordinate. To the first, the transformation of concrete bodies from one to another within possible limits. To the second, invention in all generation and motion of a Secret proceeding continued from an apparant efficient and visible matter to a new form; as also the invention of an hidden schism of resting bodies not in motion.

Although the ways leading to the power and humane science, be nearly allied and almost the same, nevertheless it is the safest, because of that old and pernicious custome, of spending time in abstracts to begin and raise sciences from their very foundations, which look upon the active part in order, that it might consume and determine the active part, therefore we must see to some nature to be superinduced upon another body, what precept or direction any should require for that purpose, and that in an easie and plain expression.

For example, suppose any should desire to cover over Silver with the yellow colour of Gold, or give unto it an increase of weight, with a regard to the Laws of matter, or to make an obscure stone become transparent, or glass glutinous, or to cause a body not vegetable to grow; we must see in such a case what direction or deduction may chiefly be desired, first a person would doubtless wish for something of a like Experiment to be shewn unto him, which might not fail in the operation, nor deceive in the undertaking. Secondly, he would desire some directions which might not bind him, and force him to certain mediums, and parti-

cular ways of acting, for it may be, that he may be unable to purchase, and procure unto himself such mediums, therefore if there be any other mediums and other methods of acting, besides that direction of producing such a nature, it may perhaps be of such things, as are in the power of the Worker; yet notwithstanding he may be excluded from the tryal of such things by the narrowness of the Rule, so as that he shall meet with no benefit. Thirdly, he may desire, that something may be shewn unto him, which may not be altogether so difficult, as the operation that is in question, but that comes nearer to the practise.

Therefore it is requisite, that every true and perfect Rule of working be certain, free, and well designing, or in order to action; therefore this is the same as the invention of a true form, for the form of any nature is such, that when it is supposed the nature it self must needs follow, therefore it is always present, wherever that nature is, it be speaks it in general and constitutes it. Such is the form of a thing that when it is taken away the nature of the thing is removed.

Therefore it is always absent from it, when that nature is absent, and is in it alone. Lastly, a true form is such, that it deduceth the nature of a thing out of the Fountain of being, which is common to many, and more known than the nature, as they speak, than the form. Therefore the Rule of knowing a true and perfect Axiom is this, *that another nature might be found out which might be convertible with the nature given, and yet be the limitation of a more known nature, like as of a true genus.* These two Rules, the one active, the other speculative, are the same in effect, and what is most useful in operation is most true in speculation.

But the Rule or Axioms of transforming bodies are two fold. The first consider'd a body, as a troop or conjugation of simple natures, as in Gold these things do meet, that it is yellow, weighty, and of such weight that it may be beaten thin and drawn into wire, of such a bigness that it is not volatile, and that it loseth nothing by fire, that it is to be run in such a manner, that it is to be separated and loosned by such means, and the like of the other natures or properties of Gold.

Therefore such an Axiom deduceth the thing from the forms of the simple natures or properties, for he that knows how to bring new forms and methods of yellow, of weight, of fluidity, &c. he will see and take care of their graduations and means, that all these be conjoined in one body from whence transformation into Gold may be expected. Therefore this manner of marking belongs to the primary action, for there is the same method required in bringing forth one simple nature, as many; onely man meets with more difficulty in working, when he is to joyn together many natures, which meet not of themselves unless by the ordinary and usual ways of nature; nevertheless we may affirm that the method of working, which considers the simple natures, though in a concrete body, proceeds from those things, which in nature are constant, eternal, and universal, and open a wide door to mans ability, which as affairs are now manag'd our humane understanding can scarce comprehend or represent.

But the Second kind of Axioms, which depends from the invention of a secret proceeding, acts not by simple natures, but by concrete bodies, as they are found in natures ordinary course; for example, suppose an Inquisition is made from what beginnings, how, and in what manner Gold, or any other Metal, or Stone is generated from its first matter and deform substance until it comes to a perfect mineral, likewise in what manner Herbs grow,

form

form their first concretion of the sap in the earth, or from the seed until it riseth up to be a plant with all the succession of motion, and the divers, and continued endeavours of nature. Likewise of the ordinary generation of animals from their conception to their birth, in like manner of all other bodies.

But this inquisition relates not onely to the generation of bodies, but also to other motions and workings of nature; for example, suppose an inquisition be made into the universal series, and continued manner of nourishment, from the first reception of the Food, until it turns into the substance of the body; likewise of the voluntary motion in animals, from the first impression of the fancy, and repeated endeavours of the spirits, to the movings and turnings of the Arters, or of the outward motion of the tongue, and lips, and other instruments to the giving of articulate voices; for these things relate to concrete or collegious bodies, and in operations they are lookt upon as particular and special custom of nature, not as fundamental, and common Laws, which constitute forms. But we must needs confess, that this method seems to be the most expedite, the most likely and hopeful, and more than the other primary.

But likewise the operative part, which answers this speculative, doth enlarge & encourage, working from those things, which are commonly found in nature, to certain things near at hand, or from those things to other very remote: but the highest and radical operations upon nature depend somewhat upon the primary Axioms. Moreover, when man hath not the liberty of acting, but onely of knowing and beholding, as in caelestial bodies, which are not within mans reach he cannot change nor alter them. Nevertheless the inquisition of the fact it self, or of the truth of the thing, as well as the knowledge of causes and agreements, relates to the primary and universal Axioms of simple natures as the nature of voluntary relation, or the attractive vertue of the load stone, and many others, which are more common than the Caelestial: neither can any body hope to terminate the question, whether in the daily motion, the earth doth in truth come round, or the Heavens unless he understands first the nature of voluntary rotation.

The hidden proceeding, which we have mentioned, is otherwise, so that our humane understanding, as it is now wrapt up in blindness, cannot easily search into it; neither do we understand certain measures, signs, or degrees of proceeding visible in bodies, but that continued proceeding, which for the most part is not subject to our senses.

For example, In all generation and transformation of bodies, we must inquire what is last, and what flies away, what remains, what is added, what dilates it self, what is drawn to it, what is united, what is separated, what is continued, what is cut off, what means, what hinders, what commands, and what yields, and many other things.

Again, neither are we to enquire after these things in generation and transformation of bodies, but in all other alterations and motions we are likewise to enquire, what proceeds, and what succeeds, what is most fierce, and what is most remis, what gives the motion, what commands, and the like.

All these things are unknown to, and never handled by the Sciences, which are composed by the grossest and the unablest wits. Seeing every natural action is transacted by the least beginnings, or by such as are so small, that they are not to be perceived by our senses, no body can hope

to rule or turn nature, unless he can comprehend and take notice of them in a due manner. Out of the two kinds of Axioms, which are already mentioned, Philosophy and Sciences are to be divided, (the common received words which approach the nearest to the discovery the of things, being applied to our meaning) namely that the inquisition of forms, (which in reason according to their own Laws are eternal and unmovable, constitutes the Metaphysicks; but the inquisition of the efficient, of the matter, of the secret proceeding, and hidden schismatism, all which things regard the common and ordinary course of nature; not the fundamental and eternal Laws, should constitute the Physicks. Now to these are subordinate two practical Sciences; to Physick the Mechanick is subordinate, and to the Metaphysicks, the better sort of Magick, in regard of its large ways and greater command in nature.

Now that we have thus described our doctrine we must proceed to the precepts in a right and orderly manner; therefore the discovery of the interpretation of Nature contains chiefly two parts. The first tends to the drawing out and raising Axioms from experience; the second teacheth how to take and derive Experiments from new Axioms. The first part is divided in a threefold manner into three ministrations; into that which relates to sense, into that which relates to the memory, and to that which relates to the mind or understanding.

First we must have a Natural and Experimental History; sufficient and good, which is the foundation of the thing: It must not be feigned or contrived onely, but we must find what Nature doth, or bears.

But the Natural and Experimental History is so various and scattered that it confounds and disturbs the understanding; unless it be limited and placed in a right order; therefore we must form some tables and ranks of instances in such a manner and order, that the understanding may work upon them.

Which, when it is done, the understanding left to it self, and moving of it self, is not sufficient, but unable, for the working of Axioms, unless it be ruled and assisted; therefore in the third place a lawful and true induction is to be brought in, which is the Key of the Interpretation; we must begin at the End and proceed back-wards to the rest.

An inquisition of forms proceeds in this manner, first, upon nature given, we must bring to the understanding all the instances of notes, that agree in the same Nature, though by different matters; Therefore such a collection is to be Historical, without any hasty contemplation or greater subtilty than ordinary, for example in the inquisition of the form of Hot.

Convenient Instances in the Nature of Hot.

1. **T**he Sun beams chiefly in Summer; and at Noon.
2. The Sun beams beaten back and pressed together; specially between Mountains, Walls, and through Burning-glasses.
3. All fiery Meteors.
4. Fiery Thunderbolts.
5. The bursting forth of flames out of the Caves of Mountains, &c.
6. All Flame.
7. All solid bodies of fires
8. Hot and Natural Baths.

9. All

9. All liquids heated or boiling.

10. Vapors and hot smoak, and the air it self, which receives a strong and furious heat, when it is shut up, as in all places of reflection.

11. Some kind of storms, by the constitution of the air, when there is no respect to the time of the year.

12. The air shut up in subterraneous Caves, chiefly in winter.

13. All hair and shag, as wooll, the skins of beasts, feathers, have something of heat.

14. All bodies, as well solid as liquid, as well thick as thin, as the air, may be heated for a time.

15. Sparks of fire out of Iron or steel, when they are struck out.

16. All bodies rubb'd together as a stone, wood, cloth, &c. So that the axle-trees, and wheels of Carts sometimes are enflamed.

And the custome amongst the Western Indians is to make fire by rubbing.

17. All green Herbs, and moist, shut up close together, as Roses, Pease in a basket, and Hay, if it be laid up wet will often take fire.

18. Lime watered.

19. Iron when it is first dissolved by strong waters, in glass without any assistance of fire, and likewise Pewter, &c. which is not so hot.

20. All animals chiefly in their inwards, though the heat in insects, because of the smallness of their bodies cannot be perceived by our feeling.

21. Horse-dung and the new excrements of such like creatures.

22. Strong oil of Sulphur and Vitriol performs the office of heat in burning linning.

23. The oyl of wilde Majoram, and the like, doth the office of heat in burning bones and teeth.

24. The strong spirit of wine well rectified performs the office of heat, so that if the white of an Egg be cast into it, it will thicken and whiten almost in the same manner, as when it is boiled, and cloth being cast into it will burn, and be brown as a toasted piece of bread.

25. All sweet sents, and hot herbs, as dragon-wort, cresses, &c. Although the hand feels not their heat, neither when they are entire, nor when reduced to ashes, but when they are chewed a little, they heat the tongue, and the pallet, as if they did burn.

26. Strong vinegar, and all things acide or sharp, are hot in a member, where there is no * *Epidermis*, as in the eye and tongue, and in a wounded part, or where the skin is taken off, they cause pain like to that of heat.

27. Also extraordinary cold seems to be burning.

28. Garlick.

This List we are want to name the Table Essence and Presence.

Secondly, we must examine with our understanding the instances which are deprived of * nature given.

* Or skin to cover such as covers the body.

* Natura data.

The Instances at hand which have not the nature of heat.

THe beams of the Moon, of the Stars, and of the Comets seem not to be hot to our feeling, for we may observe that the greatest frosts are

are in the full Moon, but the fixed and bigger Stars, when the Sun goes under them, or draws near them, they are thought to be heated by the heat of the Sun, as when the Sun is in *Leo*, or in the Dog Days.

The Sun beams, in the middle region of the air, are not hot: The reason is, because that region is not near enough to the body of the Sun, from whence the beams burst forth, nor to the earth that reflects them back; therefore this is plain, upon the tops of mountains, which are not the highest, snow abides upon them alwayes. But on the contrary, some have taken notice, that on the top of the Pick of *Tenerif*, and on the top of the Mountains of *Peru*, there is no snow to be seen, but upon the sides of these hills snow remains; therefore the air on the top of those Mountains is not cold, but subtil and sharp, so that in the mountains of *Peru* it pricks and offends the eyes with its sharpness, and the stomach, so that it makes men inclinable to vomit. The Ancients have taken notice, that, on the top of mount *Olympus*, the air is so subtil, that such as climb up to the top, must carry with them sponges dipt in water and vinegar, and often put them to their mouths and noses, because the air is there so subtil, that it sufficeth not for respiration. They say also that there is there so great a calm, free from all rain, storms, snow, and winds, that some who sacrificed there, upon *Jupiters* altar, having made with their fingers an impression in the Ashes upon the Altar, the next year the same Letters and impression were to be seen without the least alteration. And such as venture up to the top of the Pick of *Tenerif* go by night and not by day, they are called upon a little after the rising of the Sun by their guides to hasten down again, because of the danger, as it seems, caused by the subtilty of the air, for fear that it should stifle the spirits.

The reflection of the Sun beams near the northern pole are very weak and inefficacious in matter of heat.

Let this Experiment be tried, take a Looking Glass made contrary to the burning-glasses, and put it between your hand, and the Sun beams, and take notice whether it don't diminish the heat of the Sun, as the burning-glass increaseth it.

Try this other Experiment, whether by the best and strongest burning-glasses it is not possible to gather together the beams of the Moon in one point, and cause thereby a small degree of warmth.

Try also a burning-glass upon any thing that is hot, but not luminous or shining, as upon hot urine, or hot stone, which is not fiery or upon boiling water or the like, and see whether it increaseth not the heat, as at the rayes of the Sun.

Try also a burning glass before the flame of the fire.

The Comets have not always the same effects in encreasing the heat of the year, though some have observed that grievous droughts have succeeded them. Bright beams, and columns, and * *Chasmata*, and such like meteors appear more frequently in the winter than in the Summer, and especially in great frosts, when the air is very dry. Thunder and Lightnings seldom happen in Winter, but in the time of great heats. But falling Stars are thought to consist for the most part of a thin substance, bright and kindled, near a kin to the strongest fire.

There are some Lightnings that yield light but don't burn, such happen alwayes without thunder.

The breaking out, and eruptions of flames are to be seen in cold regions as well as in hot, as in *Islandia*, *Greenland*, as the trees which grow in cold Countreys

* Gaping of the firmament.

Countreys are more combustibile, more full of Pitch, and Rosom, than others that grow in hot Regions.

All flame is hot, more or less; Nevertheless, they say, that *Ignis fatuus*, which lights sometimes against a wall, hath but little heat: it may be like the flame of the spirit of wine, which is mild and soft; but that flame is yet milder, which some credible and discreet Historians affirm to have been seen about the hair and heads of Boys and Girls, which did not so much as singe the hair, but did softly wave above them.

Every thing that is fiery, when it turns into a fiery red, when it should not yield any flame, it is always hot.

Of hot Baths, which happen by the situation and nature of the Sun, there hath not been sufficient inquiry.

All boiling liquors in their own nature are cold, for there is no liquor to be toucht, which is so naturally, which remains always hot, heat therefore is given to it for a time, as an acquired nature or quality; so that the things themselves, which are in their operations most hot, as the spirit of Wine, some chymical Oiles, and the Oyl of Vitriol, and of Sulphur, and the like, which at the first touching are cold, but soon after they burn.

There is a doubt whether the warmth of wool, of skins, and of feathers, and the like, proceed not from some small inherent heat, as it riseth from animals, or whether it proceeds not from a fatness and Oyliness, which is agreeable to warmth, or whether it comes not from the inclusion and fraction of the Air.

There is nothing Tangible, or yielding spirit, but is apt to take fire: yet many things differ in this, that some receive heat sooner, as Air, Oyl, and water; others not so quickly, as Stone, and Metals.

There can be no sparks struck out of Stone, or Steel, or out of any other hard substance, unless some minute parts of the substance of the Stone or Metal be also struck out.

There is no Tangible Body to be found, but becomes warm by rubbing; therefore the Ancients did fancy, that the heavenly Globes had no other warmth or vertue to cause heat, but that which was derived to them from the attrition of the air, when they were rowled about in their swift and furious course.

Some Herbs and Vegetables, when they are green and moist, seem to have in them some secret heat; but that heat is so small, that it is not to be perceived by feeling when they are single, but when they are heaped together, and shut up, that their spirits cannot escape out into the air, but encourage one another, then the heat appears, and sometimes a flame in convenient matter.

New lime becomes hot when it is sprinkled with water, either because of the union of heat, which before was dispersed, or by the irritation and exasperation of the spirits of water and of fire; for there is a kind of conflict and antiperistasis. How the heat is caused will easily appear, if instead of Water, Oyl be cast into it, for Oyl, as well as Water, Unites the Spirits shut up, but it will not Irritate or anger them.

All dung of Animals, when it is old, hath the power of heating, as we may see in the fattening of ground.

Aromatick substances, and Herbs sharp at the taste, are much hotter when they are taken inwardly; we may try upon what other substances they discover any hot vertue. The Seamen tell us, that when heaps and
E lumps

lumps of Spices or Aromatick substances, are long shut up clofs, and then opened, there is some danger for such as stir them, or take them out first; for the fumes that arise from them are apt to inflame the spirits, and to give fevers. Likewise an Experiment may be tried, whether their dust will not be able to dry Bacon, and other flesh hung over it, as over the smok of a fire.

There is an accrimony or penetration in cold things, as Vinegar, and Oyl, of Vitriol, as well as in hot, as in the Oyl of wilde Marjoram, and the like; therefore they cause a like pain in animals, and in inanimate substances they dissolve, and confirm the parts. In animals there is no pain but is accompanied with a certain sense of heat.

Cold and hot have many effects common to them both, tho produced in a different manner; for snow seems to burn the hands of children, and cold preserves flesh from putrefaction, as well as fire, and heat draws together some substances to a lesser bulk as well as cold.

A Table of degrees, or of such things as are comparatively hot.

WE must first speak of those things, which seem not to the feeling to be hot, and yet are so potentially afterwards: we shall descend to mention such things as are actually, or at the feeling hot; and to examine their strength and degrees of heat.

1. Amongst the solid and Tangible bodies, there is none found, which is hot naturally or Originally, neither Stone, nor Metal, nor Sulphur, nor any Mineral, nor Wood, nor Water, nor the Carcase of any animal; but in baths there is hot water by accident, either by subterraneous flames, as fire; such as is in *Etna*, and many other mountains, or by the conflict of bodies, as heat is produced in the dissolution of Iron and Pewter. Therefore our feeling cannot be sensible of any degree of heat in inanimate substances, but they differ in their degrees of cold, for Wood is not so cold as Metals.

2. But touching things that have heat potentially in them, and that are ready to kindle, there are many inanimate substances of that nature, as Sulphure, Naptha, Salt-peter, &c.

3. Those things which before were inflamed, as the Horse dung, by an animal heat, or lime, ashes, and soot; by the fire they yet retain certain reliicks of their former heat. Therefore there are certain distillations, and separations of bodies, effected by the heat of Horse dung; and the heat is raised in lime by Water, as we have already said.

4. Amongst the Vegetables there is no plant, nor part of a plant; as the droppings, or sap, which seems to our feeling to be hot.

5. There is no part of dead animals nor any thing separated from them, which appears hot, nor the Horse-dung it self, unless it be shut up, and buried close. But nevertheless all dung seems to have heat potentially in it, as may appear by the improvement of the ground. Likewise the CorpSES of dead animals have the same secret heat potentially; therefore in Church-yards, where they are daily buried, the ground hath by that means acquired a secret heat, which soon consumes a Carcase newly buried, and sooner than other earth.

6. Whatsoever fatness the ground, as all sorts of dung, Chalk, Sea-sand, Salt, and the like have a secret disposition and tendency to heat.

7. All Putrefaction hath some beginnings of a little heat, though not to that degree as to be perceived by feeling

8. The

8. The first degree of heat of those things, which are to be felt. To be hot by feeling is the heat of animals, that have a great Latitude of degrees, for the lowest degree, as in insects, is not to be perceived by touching. The highest degree scarce attains to the degree of heat of the sun beams in the hottest Regions and Times: Nevertheless it is reported of *Constantine* and of several others, that they were naturally so hot, and their constitution so dry, that in several violent feavers their bodies did burn so much, that when any did but touch them with the hand it would seem to burn a while after.

9. All animals do encrease their heat by motions and exercise, by Wine, good Chear, and Venery, and in burning Feavers, and pain.

10. All animals in the intervals of Feavers are ceased with Cold and shivering at first, but a little after they burn the more.

11. We may further inquire and compare the heat of several animals, as of Fishes, four Footed Beasts, Serpents, Birds, and according to their several species, as in a Lyon, in a Kite, or a Man; for, according to the common opinion, Fishes are inwardly less hot, Birds most, especially, Pigeons, Hawks, and Austriches.

12. Let us inquire further of the heat compared in the same animal with the several parts and members, for Milk, Blood, Seed, Eys, are of a moderate degree of warmth, and less hot then the exterior flesh of animals, when it moves and is stirred about, but what degree of heat is in the brain, stomach, heart, and other parts, was never yet found out.

13. All animals, during the Winter and in Cold storms, are outwardly cold, but inwardly they are thought to be hotter than in summer.

14. The Cœlestial heat, in the hottest Regions, times of the Year, and Day, is not so hot as burning Wood, Straw, or Linnen, neither doth it burn but through a glass.

15. The Astrologers inform us, that some Stars are hotter than other, Amongst the Planets, next to *Sol*, *Mars* is the hottest, afterwards *Jupiter*, then *Venus*, but *Luna* is thought to be Cold, and *Saturn* colder: Amongst the fixed Stars *Sirius* is the hottest; then *cor Leonis* or *Regulus*, afterwards the Dog Star, &c.

16. The Sun warms most when he is nearest to our Zenith, over our Heads; the same we may think of the other Planets, according to their degree of heat, for example, *Jupiter* is hotter when he is under *Cancer* or *Leo*, than when he is under *Capricornius* or *Aquarius*.

17. The Cœlestial heat is increased three several ways, Namely, when the Globe is over our heads, when it draw near by propinquity, and by a conjunction or association of several Stars.

18. There are several degrees of heat in flames, and fires in strength and weakness.

19. I Judge that the flame, that bursts forth and proceeds from certain imperfect metals, is very strong and fierce.

20. But the flame of thunder seems to be fiercer than all other flames, for sometimes it hath dissolved Iron itself into drops, which all other flames cannot do.

21. In things set a fire there is also a different degree of heat, we esteem the weakest to be burn'd Linnen, or Tinder, touch Wood or Match; after them the weakest fire is that of a burnt coal, and laths set a fire: But the hottest we think to be Metal inflamed, as Iron and Copper, &c.

22. Motion increaseth heat, as we may perceive by blowing with bellows: for some of the harder sort of Metals are not to be dissolved, or liquefied by a dead fire, unless it be Stirred up by blowing.

23. We Judge that the great fires that happen, when the Wind blows hard, do struggle and strive more against the wind than they do yield to it, for the flame in such a case flies back with a greater fierceness when the Wind yeilds than when it drives it.

By the common fire, especially by the subterraneous fires, which are the remotest and shut up closest from the rayes of the Sun, you may expel the Caelestial Nature from the form of hot.

By the heating of bodies of all sorts, I mean of Minerals, of Vegetables, and of the exterior parts of Animals, of Water, of Oile, &c. In drawing them nearer to the fire or any hot body you may expel all variety, and subtil texture of bodies. By Iron or other fiery Metals, which may heat other bodies without minishing ought of the weight or substance, expel the mixture of the substance of another hot thing.

Here follows several other directions and precepts most useful, if well understood; but because I am limited I proceed to the other helps of nature interpretation recommended by the worthy Author. First, He placeth prerogatives of instances. Secondly, Helps of induction. Thirdly, A rectification of induction, &c. Amongst the prerogatives of instances the solitary instances are first. They are such as discover the nature, which is inquired after in such subjects, which have nothing common with other subjects, except that Nature. And again, such as discover not the nature inquired for in such subjects, which are like in all things with other subjects, unless it be in the Nature it self for example, if the Nature of Colour, is inquired into, the solitary instances are Gems of Chrystal, which yeild not not only a color in themselves, but cast it upon a Wall.

They have nothing common with the fired colours in flowers, coloured Gems, Metals, Wood, &c. unless it be the Colour; from whence it may easily appear, that colour is nothing else but a Modification of the Image of light cast into, and received in the first kind, by divers degrees of lightning upon the body; in the Second, by the textures and various schematisms of the body.

The Second are the instances called Migrantes, they are such in which the nature inquired for passeth to the generation, when before it was not, or contrariwise passeth to corruption, when it was before these instances are useful for a right understanding of the nature of things, and to direct us to practise; for example, suppose the nature of whiteness be inquired into, the instance putting to generation is whole glass, and glass beaten to with powder, likewise simple water, and water stirred about into froth, for whole glass and water are transparent, not white, but glass beaten and water turned into froth, are not transparant, but white; therefore we must inquire what happens from that change or passage to glass or water; for it is evident that the form of whiteness is conveyed in by the contusion of the glass, and the stirring of the water, and there seems to be nothing added besides the communion of the parts of glass and water, and the mixture of the air.

By these instances we may understand such as pass, not onely to generation and privation, but such as proceed to Majoration and Minoration; for they tend also to discover to us the true forms of things.

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The Third assistances are named offensive, they are such as discover the nature inquired, for nakedly and in it self also, in its rise, and highest degree of power, free from all impediments; for as every body receives the forms of many natures conjoynd, so as that in the concrete one weakness depresseth, breaks, and binds another, by that means every form is obscured: Now there are some subjects to be found in which the nature sought for is above the rest in its full vigor, either by the absence of the impediment, or by the predominancy of its vertue. These Instances do chiefly discover the nature of forms. For example, if you inquire for the nature of weight take quick-silver, which is the heaviest of all other things beside Gold, which is not much heavier: But the instance of quick-silver is more proper to discover the nature of weight, than Gold; because Gold is solid and close, but quick-silver is liquid and full of spirits; nevertheless it is heavier than Diamonds, and the most solid things, from whence we may understand the form of weight, which consists in the abundance of the matter, not in the compactness and closeness of the thing.

The Fourth instances are named clandestine. They shew the nature inquired for in its lowest power, and as it were in the Cradle and beginning, rising and hid under a contrary nature that domineers over it. These instances are of great consequence to find out the forms of things; for example, if we inquire for the nature of solid; the clandestine instances are such as discover a weak, and lowest degree of consistency, a solidity in a fluide substance, as in a buble of water, which is as a thin skin of solidity determined and made of a watery body. By this example, and by snow, froth, and melted Metals, we may understand that liquid and solid, are but ordinary notions, agreeable to the sense, for in truth there is in every body a liquidity which is weaker and more infirm in bodies homogeneous, as water, but stronger in heterogenous, therefore the conjunction to an heterogeneous body unites and joyns together, but the insinuation of the homogeneous dissolves and loosens.

The fifth sort of Instances are named Constitutive. They are such as constitute a species of the nature inquired into, as a lesser form, for as the lawful forms which are convertible with the natures sought for, are hid in secret, & are not easily to be found, the thing it self and the weakness of our intellect requires that the particular forms be not neglected, but be diligently inquired into, for whatsoever unites nature, although in an imperfect manner, it shews a way to find out forms.

For example, if any desires to understand nature of memory, or that which excites or helps memory, the constitutive instances are order and distribution, which evidently help our memory, also places in an artificial memory, &c. So that there are six lesser forms of those things which help memory; namely; limitation, a reducement of intellectual matters, to a sensibility an impression into a strong affection, an impression into a pure and disingaged mind, a multitude of helps and a former expectation.

The Sixth are conformable instances or proportioned, for they shew similitudes, agreements, and conjugations of things, not in the lesser forms, as the constitutive instances do, but in a concrete body. They shew and discover a certain agreement between bodies, although they don't much conduce to find out forms, nevertheless they are very beneficial to reveal the Fabrick of several parts of the universe, and in its members they make a kind of dissection, and therefore they lead us, as it were, by the hand to high and noble axioms.

For

For example, these are conformable Instances, a looking glass and an eye, the make of the ear, and the places where the Eccho sounds, but of which conformity, besides the observation of resemblance, which is very useful for many things, it is easie to gather and form this Axiom, *viz.* that the organ for the senses, and the bodies, that send back the sounds to the sense, are much alike. Again, the understanding being from hence informed, may easily rise to another Axiom higher and more noble; namely, that there is no difference between the Consents, or Sympathies, of Sensible Bodies, and such as are inanimate without sense, unless it be that in the former, there is an animal spirit in the body, fitted to receive and entertain it, but in the latter there is none. Therefore as many consents as there are in inanimate bodies, so many senses there might be in animals, if there were as many holes or perforations in the animate body, for the animal spirit to move and fly to the member rightly disposed, as a right organ, &c. Another conformable instance is the root of a plant, and the branches. Every vegetable swells and pushes out its parts round about as well downwards as upwards neither is there any Difference between the roots and branches, but only that the root is shut up in the Earth, and the branches, spread in the air and the Sun, for if any one will but take a tender branch that grows, and turn the top towards the ground, though it toucheth not the earth, it will push forth a Root and not a Branch. And on the contrary, if the earth be put upon a plant, and be prest with a stone or other hard substance that might hinder the plant from spreading up, it will bring forth branches in the ground and underneath.

Other conformable instances are the Gum of Trees, and the most part of the gems of Rocks, for either of them are but the exudations and sweatings, the first out of the sap of trees, the Second out of Rocks, from hence proceeds the clearness and splendor of both. Namely from the thin and subtil percolation from hence it is also that the hairs of animals are not so beautiful and of such a lively colour as the plumes of birds, for their sweat is not so fine when it issues out of their skin as when it comes out of a Feathers.

Other conformable instances are the Fins of Fishes, and the Feet of four Footed Beasts, or the Feet and Wings of Birds unto which *Aristotle* adds four Circles in the motion of Serpents. Therefore in this great Fabrick of the World, the motion of living creatures seems to be performed by four Arters or flexions.

Also in terrestrial animals the teeth, and in birds, their bills are alike, from whence it is evident that in all perfect animals there is a certain hard substance that draws to the mouth.

The Seventh are irregular instances, such as discover bodies in their whole, which are extravagant and broken off in Nature, and do not agree with other things of the same gender, but are only like to themselves, therefore stiled *Monodica*. They are useful to raise and unite nature, to find out the genders and common natures, to limit them by their true differences. Neither are we to desist from an inquisition until the properties and qualities, which are found in such things as are thought to be miracles in nature, may be reduced, and comprehended under some form or certain Law, that all irregularity and singularity might be found to depend upon some common form.

Such instances are the Sun and Moon amongst the Stars, the Loadstone among the Stones, quick-silver amongst metals, the Elephant, amongst the four footed

Footed Beasts, &c. The eighth sort of instances are named *Diviantes*, because they are Natures errors, and Monsters, when Nature declines and goes aside from its ordinary course. The use of these is to rectifie the understanding, to reveal the common Forms; neither in these ought we to desist from the inquisition until we have found out the cause of the deviation. But this cause doth not rise properly to any Form, but onely to the hidden proceeding to a Form, for he that knows the ways of Nature, he shall with more ease observe its deviations. And again, he that understands its Deviations can better discover its ordinary ways and methods.

The Ninth sort of instances are Named *Limitanea*, such as discover the species of bodies, which seem to be composed of two species, or the Rudiments between one species and another: [such are Flies between rottenness and a plant, certain Comets between stars and fiery meteors, Flying, Fishes, between Birds, and Fishes, &c.

The Tenth are instances of Power, which are the noblest, and the most perfect, as the most excellent in every art; for as this is our business chiefly, that Nature should be obedient and yield to the benefits of men; it is fitting, that the works, which are in the power of men, as so many provinces, be overcome and subdued, should be taken notice of, and reckoned specially such as are most plain and perfect, because from them there is an easier and a nearer way to new inventions, never found out before.

The Eleventh instance are stiled *Comitatus* and *Hofiles*. They are such as discover a concrete body, such in which the nature inquired after, doth always follow it as an individual companion, and on the contrary, in which the Nature required doth always fly from it, & is excluded out of its company as an enemy: for out of such instances propositions may be formed, which may be certain, universal, affirmative, and negative, in which the subject shall be such a body in concrete, & the predicate the nature it self that is sought, for example if you seek for hot the *Instantia comitatus* is the flame, &c.

The Twelfth are *subjunctive*, &c.

The Thirteenth are instances of Union which confound and joyn together Natures, which are esteemed to be heterogeneous, and for such are noted and confirmed by the received divisions.

For example, if the nature required is hot. That division seems to be good and authentick, that there are three kinds of heat; the Cœlestial, the animal, and that of the fire. These heats especially one of them being compared with the other two, are, in essence and species, or by a specifick nature, differing and altogether heterogeneous; for the heat of the Cœlestial Globes, and the animate heat, encourage and help generation; but the heat of the fire corrupts and destroys. It is therefore an instance of Union. This experiment, is common enough when the branch of a vine is brought into the house, where there is a continual fire, by which the Grapes will ripen a month sooner than those that are in the air: so that fruits may be brought to Maturity when they hang upon the tree by the fire, whereas, this seems to be a work proper only to the Sun. Therefore the understanding is perswaded from hence to inquire, what are the differences which are really between the heat of the Sun and that of the fire; from whence it happens that their operations are so unlike, and they nevertheless partake of the same common nature. The differences are found to be four. First, that the heat of the Sun in respect of the heat of the fire is a degree much milder and more favourable. Secondly, That it is conveyed, to us through the air, which of it self is humide. Thirdly, and chiefly that it is very unequal, sometimes drawing

near and increasing in strength, anon departing and diminishing, which very much contributes to the generation of bodies. Fourthly, that the Sun works upon a body in a long space of time; but the working of the fire, through mens impatiency, performs the business in a shorter time. If any will be careful to attemper and reduce the heat of the fire to a more moderate and milder degree; which may be done several ways, if he will besprinkle it, and cause it to send forth something of humidity; chiefly if he imitates the Suns inequality. Lastly, if he stayes a little, by this means, he shall imitate or equal, or in some things cause the fires heat to be better than the Suns.

The Fourteenth sort of instances are the Judicial, which is when an inquisition is made, and the understanding is placed in an *Equilibrium*, in an uncertainty where to assign the cause of the Nature inquired for.

For example, suppose any man seeks the cause of the flux and reflux of the sea twice a Day. This motion must needs proceeds from the progress and regress of the waters, in the manner of water troubled up and down in a bason, which when it toucheth the one side of the bason, it leaves the other. Or it must proceed from the rising and falling of the waters in the bottom, as boiling water: now there is a doubt unto which of these causes the ebbing and flowing, or flux and reflux of the sea is to be assigned, which if the first of these be asserted, then it will follow, that when the flux is on this side, the reflux will be at the sametime on the other. But *Acosco* with some others have found after a diligent inquiry, that upon the Coast of *Florida*, and upon the Coast of *Spain*, and *Africa*, the ebbing and flowing of the Sea happens at the same moment of time. *This question is further examined in the Original.*

The Fifteenth sort of instances are of divorce, because they discover the separations of those natures which often meet.

The Sixteenth are the Instances of the lamp, or of the first information, which assist the sense, for as all interpretation of nature begins by the sense, and from the perception of the sense leads by a right and straight-way to inform the understanding, which are the true notions and axioms; it must needs be, that the more copious and exact the representations of the senses are, so much the better and the happier all things must succeed.

The Seventeenth sort of Instances are stiled of the Gate, because they help the immediate actions of the senses. Amongst the senses, it is certain that the sight is the chief, in regard of informations; therefore we must seek assistances to this sight.

The eighteenth are Instances called *Citantes*, which deduce that which is not sensible to be sensible.

The Nineteenth are Named Instances of supplement, because they supply the understanding with a right information when the senses fail, therefore we must Fly to them, when we have no proper instances. This is done in a two fold manner, either by Gradation, or by Analogy. For example, the Medium is not to be found which stop the Load-stone in moving the Iron, neither gold, if we put it between, nor silver, nor stone, nor glass, nor wood, &c. Nevertheless after an exact tryal, there may be a certain medium found, which might dull its vertue more than any thing else comparatively, and in some degree, as that the loadstone should not be able to draw Iron to it felt through gold of such a thickness, &c.

The Twentieth sort are stiled Instances *persecantes*, because they cut nature asunder, &c.

The One and Twentieth sort are instances of the Rod, or of *non ultra*.

The Two and Twentieth are called Instances *Curriculi*. They measure nature by the moments of time, as the instances of the Rod measure it by the degrees of space. For all motion and natural action is performed in a time, some quicker, some softer, &c.

The Three and Twentieth sort are instances *Quanti*, &c.

The Four and Twentieth sort are instances of Predominancy,

The 25. sort are called *Innuentes*, because they discover and design the benefits of men.

The Six and Twentieth sort are named *Instantia Polychrestas*.

The Seven and Twentieth are the Magick instances. They are such in which the matter or the officient is but little and slender, if compared with the greatness of the work, or of the effect that follows, in somuch that though they are common, they are looked upon as miracles, &c.

I am forced to cut short, and abbreviate many excellent directions, and to pass over several weighty observations, because I am limited. However this abbreviation may give the Reader a taste of the whole.

FINIS.

NEW
ATLANTIS.

A Work unfinished.

Written by the Right Honourable

FRANCIS

Lord Verulam, Viscount St. Albans.



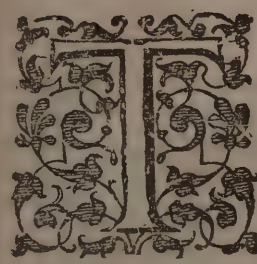
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TO THE
 READER.

 His *Fable* my Lord devised, to the end that he might exhibit therein a *Model*, or *Description* of a *Colledge*, instituted for the Interpreting of *Nature*, and the producing of great and marvellous *Works* for the benefit of *Men*, under the Name of *Solomons House*, or, *The Colledge of the Six days Works*. And even so far his Lordship have proceeded as to finish that Part. Certainly the *Model* is more vast and high, than can possibly be imitated in all things; notwithstanding most things therein are within Mens power to effect. His Lordship thought also in this present *Fable* to have composed a Frame of *Laws*, or of the best State or Mould of a *Commonwealth*; but fore-seeing it would be a long *VVork*, his desire of collecting the *Natural History* diverted him, which he preferred many degrees before it.

This *VVork* of the *New Atlantis* (as much as concerneth the *English Editions*) his Lordship designed for this place, in regard it hath so near affinity (in one part of it) with the preceding *Natural History*.

W. Rawley.

NEW ATLANTIS.



E sailed from *Pern* (where we had continued by the space of one whole year) for *China* and *Japan* by the South Sea, taking with us Victuals for Twelve Moneths, and had good Winds from the East, though soft and weak, for Five Moneths pace and more; but then the Winds came about, and settled in the West for many days; so as we could make little or no way, and were sometimes in purpose to turn back: But then again, there arose strong and great Winds from the South, with a Point East which carried us up (for all that we could do) towards the North; by which time our Victuals failed us, though we had made good spare of them. So that finding our selves in the midst of the greatest Wilderness of Waters in the World, without Victual, we gave our selves for lost men, and prepared for death. Yet we did lift up our hearts and voyces to God above, *Who sheweth his wonders in the deep*, beseeching him of his mercy, That as in the beginning he discovered the Face of the deep, and brought forth dry land: so he would now discover Land to us, that we might not perish. And it came to pass, that the next day about Evening, we saw within a Kenning before us towards the North, as it were thick Clouds, which did put us in some hope of Land; knowing how that part of the South sea was utterly unknown, and might have Islands or Continents that hitherto were not come to light. Wherefore we bent our course thither, where we saw the appearance of Land all that night; and in the dawning of the next day, we might plainly discern that it was a Land flat to our sight, and full of Boscage which made it shew the more dark; and after an hour and halfe sailing, we entred into a good *Haven*, being the Port of a Fair City, not great indeed, but well built, and that gave a pleasant view from the Sea: And we thinking every minute long, till we were on Land, came close to the Shore and offered to land; but straight-ways we saw divers of the people with Bastons in their hands, (as it were) forbidding us to land, yet without any cries or fierceness, but onely as warning us off by signs that they made. Whereupon being not a little discomfited, we were advising with our selves, what we should do. During which time, there made forth to us a small Boat with about eight persons in it, whereof one of them had in his hand a Tipstaff of a Yellow Cane, tipped at both ends with Blew, who came aboard our Ship without any shew of distrust at all: And when he saw one of our number present himself somewhat afore the rest, he drew forth a little Scroul of Parchment (somewhat yellower then our Parchment

and shining like the Leaves of Writing-Tables, but otherwise soft and flexible) and delivered it to our foremost man. In which Scroul were written in ancient *Hebrew*, and in ancient *Greek*, and in good *Latine* of the School, and in *Spanish*, these words, 'Land ye not, none of you, and provide to be gone from this Coast within sixteen days, except you have further time given you: Mean while, if you want Fresh-water or Victual, or help for your Sick, or that your Ship needeth repair, write down your wants and you shall have that which belongeth to Mercy. This Scroul was signed with a stamp of *Cherubims Wings*, not spred, but hanging downwards, and by them a *Cross*. This being delivered, the *Officer* returned, and left onely a Servant with us to receive our answer. Consulting hereupon amongst our selves, we were much perplexed. The denial of Landing, and hasty warning us away, troubled us much. On the other side, to find that the people had Languages, and were so full of Humanity, did comfort us not a little, and above all, the Sign of the *Cross* to that Instrument, was to us a great rejoycing, and as it were a certain presage of good. Our answer was in the *Spanish* Tongue, 'That for our Ship it was well, for we had rather met with Calms and contrary Winds then any Tempests. For our Sick, they were many, and in very ill case; so that if they were not permitted to land, they ran in danger of their lives. Our other wants we set down in particular, adding, 'That we had some little store of Merchandize, which if it pleased them to deal for, it might supply our wants without being chargeable unto them. We offered some reward in Pistolets unto the Servant, and a piece of Crimson Velvet to be presented to the *Officer*; but the Servant took them not, nor would scarce look upon them, and so left us, and went back in another little Boat, which was sent for him.

About three hours after we had dispatched our Answer, there came towards us a person (as it seemed) of place: He had on him a Gown with wide Sleeves of a kind of Water-Chamolet, of an excellent Azure colour, far more glossie then ours; his under apparel was green, and so was his Hat, being in the form of a Turbant, daintily made, and not so huge as the *Turkish* Turbants, and the Locks of his Hair came down below the brims of it: A Reverend Man was he to behold. He came in a Boat, guilt in some part of it, with four persons more onely in that Boat, and was followed by another Boat, wherein were some twenty. When he was come within a flight-shot of our Ship, signs were made to us, that we should send forth some to meet him upon the Water; which we presently did in our Ship-boat, sending the principal Man amongst us save one, and four of our number with him. When we came within six yards of their boat, they called to us to stay, and not to approach further; which we did: And there upon the Man whom I before described, stood up, and with a loud voice in *Spanish*, asked, *Are ye Christians?* we answered, *We were*; fearing the less, because of the *Cross* we had seen in the Subscription. At which answer, the said person lift up his right hand towards Heaven, and drew it softly to his mouth, (which is the gesture they use when they thank God) and then said, 'If you will swear (all of you) by the Merits of the *Saviour* that ye are no Pirates, nor have shed Blood, Lawfully nor Unlawfully, within forty days past, you may have License to come on Land. We said, We were all ready to take that Oath. Whereupon one of those that were with him, being (as it seemed) a *Notary*, made an Entry of this Act. Which done, another of the attendants of the Great Person, which was with him

him in the same Boat, after his Lord had spoken a little to him, said aloud, 'My Lord, would have you know, that it is not of Pride or Greatness that he cometh not aboard your Ship; but for that in your Answer, you declare, That you have many sick amongst you, he was warned by the *Conservator of Health* of the City, that he should keep a distance. We bowed our selves towards him, and answered, 'We were his humble Servants, and accounted for great Honor and singular Humanity towards us, that which was already done, but hoped well, that the nature of the sickness of our Men was not infectious. So he returned, and a while after came the *Notary* to us aboard our Ship, holding in his hand a Fruit of that Country like an Orange, but of colour between Orange-tawny and Scarlet, which cast a most excellent Odor: He used it (as it seemeth) for a Preservative against Infection. He gave us our Oath, *by the Name of Jesus, and his Merits*; and after told us, that the Next day by six of the clock in the morning we should be sent to, and brought to the *Strangers House* (so he called it) where we should be accommodated of things both for our whole and for our sick. So he left us; and when we offered him some Pistolets, he smiling, said, *He must not be twice paid for one labour*, meaning (as I take it) that he had salary sufficient of the State for his service; for (as I after learned) they call an Officer that taketh rewards, *Twice-paid*.

The Next morning early, there came to us the same Officer that came to us at first with his Cane, and told us, 'He came to conduct us to the *Strangers House*, and that he had prevented the hour because we might have the whole day before us for our business: for (said he) if you will follow my advice, there shall first go with me some few of you, and see the place, and how it may be made convenient for you, and then you may send for your sick and the rest of your number which ye will bring on Land. We thanked him, and said, 'That this care which he took of desolate Strangers, God would reward. And so six of us went on Land with him; and when we were on Land, he went before us, and turned to us, and said, *He was but our Servant, and our Guide*. He led us through three fair Streets, and all the way we went there were gathered some people on both sides, standing in a row, but in so a civil a fashion, as if it had been not to wonder at us, but to welcome us; and divers of them, as we passed by them, put their arms a little aboard, which is their gesture when they bid any welcome. The *Strangers House* is a fair and spacious House, built of Brick, of somewhat a blewer colour than our Brick, and with handsome Windows, some of Glass, some of a kind of Cambrick oiled. He brought us first into a fair Parlor above stairs; and then asked us, What Number of persons we were; and how many sick. We answered, 'We were in all (sick and whole) One and fifty persons, whereof our sick were seventeen. He desired us to have patience a little, and to stay till he came back to us, which was about an hour after; and then he led us to see the Chambers which were provided for us, being in Number Nineteen. They having cast it (as it seemeth) that four of those Chambers, which were better then the rest, might receive four of the principal men of our Company, and lodge them alone by themselves; and the other fifteen Chambers were to lodge us, two and two together; the Chambers were handsome and chearful Chambers, and furnished civilly. Then he led us to a long Gallery, like a Dorture, where he shewed us all along the one side (for the other side was but Wall and Window) seventeen Cells, very neat ones, having partitions of Cedar-wood. Which Gallery and Cells, being in

all

all forty, (many more then we needed) were instituted as an Infirmary for sick persons. And he told us withal, that as any of our sick waxed well, he might be removed from his Cell to a Chamber; for which purpose, there were set forth ten spare Chambers, besides the number we spake of before. This done, he brought us back to the Parlor, and lifting up his Cane a little (as they do when they give any charge or command) said to us, 'Ye are to know, that the Custom of the Land requireth, that after this day and to morrow (which we give you for removing your People from your Ship) you are to keep within doors for three days: But let it not trouble you, nor do not think your selves restrained, but rather left to your Rest and Ease. You shall want nothing, and there are six of our people appointed to attend you for any business you may have abroad. We gave him thanks with all affection and respect and said, *God surely is manifested in this Land.* We offered him also twenty Pistolets; but he smiled and onely said, *What, twice paid?* and so he left us. Soon after our Dinner was served in, which was right good Vians, both for bread and Meat, better then any *Collegiate* Diet, that I have known in *Europe*. we had also drinke of three sorts, all wholesome and good; Wine of the Grape, a Drinke of Grain, such as is with us our Ale, but more clear; and a kind of Sider made of a Fruit of that Countrey, a wonderful pleasing and refreshing drinke. Besides there were brought in to us great store of those Scarlet Orengees for our sick, which (they said) were an assured remedy for sickness taken at Sea. There was given us also a Box of small gray or whitish Pills, which they wished our sick should take, one of the Pills every night before sleep, which (they said) would hasten their recovery. The next day, after that our trouble of carriage and removing of our Men and Goods out of our Ship, was somewhat settled and quiet, I thought good to call our company together, and when they were assembled, said unto them, 'My dear Friends, let us know our selves, and how it standeth with us. We are Men cast on Land, as *Jonas* was out of the *Whales* Belly, when we were as buried in the deep, and now we are on Land, we are but between Death and Life, for we are beyond both the Old World and the New, and whether ever we shall see *Europe*, *God* onely knoweth: It is a kind of miracle hath brought us hither, and it must be little less that shall bring us hence. Therefore in regard of our deliverance past, and our danger present and to come, let us look up to *God*, and every man reform his own ways. Besides, we are come here amongst a *Christian* people, full of Piety and Humanity, let us not bring that confusion of face upon our selves, as to shew our vices or unworthiness before them. Yet there is more; for they have by commandment (though in form of courtesie) cloistered us within these Walls for three days, who knoweth whether it be not to take some taste of our manners and conditions; and if they find them bad, to banish us straight ways; if good, to give us further time? for these men that they have given us for attendance, may withal have an eye upon us. Therefore for *Gods* love and as we love the weal of our Souls and Bodies, let us so behave our selves as we may be at peace with *God*, and may find grace in the eyes of this people. Our Company with one Voice thanked me for my good admonition, and promised me to live soberly and civilly, without giving any the least occasion of offence. So we spent our three days joyfully and without care, in expectation what would be done without when they were expired: During which time, we had every Hour Joy

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of the amendment of our sick, who thought themselves cast into some divine *Pool of Healing*, they mended so kindly and so fast.

The morrow after our three dayes were past, there came to us a new man that we had not seen before, cloathed in blew as the former was, save that his Turbant was white with a small red cross on the top; he had also a Tippet of fine linnen. At his coming in he did bend to us a little, and put his arms abroad. We of our parts saluted him in a very lowly and submissive manner, as looking, that from him we should receive sentence of Life or Death. He desired to speak with some few of us; whereupon six of us onely staid, and the rest avoided the room. He said, 'I am by Office Governor of this *House of Strangers*, and by Vocation I am a *Christian Priest*; and therefore am come to you to offer you my service, both as Strangers, and chiefly as *Christians*. Some things I may tell you, which I think you will not be unwilling to hear. The State hath given you license to stay on Land for the space of six weeks; and let it not trouble you, if your occasions ask further time, for the Law in this point is not precise; and I do not doubt, but my self should be able to obtain for you further time as shall be convenient. Ye shall also understand, that the *Strangers House* is at this time rich and much afore hand, for it hath laid up revenue these thirty seven years; for so long it is since any Stranger arrived in this part: And therefore take you no care, the State will defray you all the time you stay, neither shall you stay on day less for that. As for any merchandise you have brought you shall be well used, and have your Return, either in Merchandise, or in Gold or Silver; for to us it is all one. And if you have any other request to make, hide it not, for ye shall find we will not make your countenance to fall by the answer ye shall receive. Only this I must tell you, that none of you must go above a *Karan* (that is with them a mile and an half) from the Walls of the City without special leave. We answered, after we had looked a while upon one another, admiring this gracious and parent like usage, 'That we could not tell what to say, for we wanted words to express our thanks, and his noble free offers left us nothing to ask. It seemed to us, that we had before us a Picture of our *Salvation* in *Heaven*; for we that were a while since in the jaws of Death, were now brought into a place where we found nothing but Consolations. For the Commandment laid upon us, we would not fail to obey it, though it was impossible but our hearts should be inflamed to tread further upon this happy and holy Ground. We added, 'That our Tongues should first cleave to the Roofs of our Mouths, ere we should forget either this Reverend Person, or this whole Nation, in our Prayers. We also most humbly besought him to accept of us as his true Servants, by as just a right as ever men on Earth were bounden, laying and presenting both our persons, and all we had at his feet. He said, *he was a Priest and looked for a Priests reward, which was our Brotherly love, and the good of our Souls and Bodies*. So he went from us, not without tears of tenderness in his eyes; and left us also confused with joy and kindness, saying amongst our selves, *That we were come into a Land of Angels, which did appear to us daily, and prevent us with comforts, which we thought not of, much less expected*.

The next day about ten of the clock the Governor came to us again, and after salutations, said familiarly, *that he was come to visit us*, and called for a Chair, and sate him down; and we being some ten of us (the rest were of the meaner sort, or else gone abroad) sate down with him: And when we were so, he began thus, 'We of this Island of *Ben-salem* (for so they call it in their

their Language) have this, That by means of our solitary situation, and of the Laws of secrecy, which we have for our Travellers, and our rare admission of Strangers, we know well most part of the Habitable World, and are our selves unknown. Therefore, because he that knoweth least, is fittest to ask questions, it is more reason, for the entertainment of the time, that ye ask me questions, than that I ask you. *We answered*, That we humbly thanked him, that he would give us leave so to do, and that we conceived by the taste we had already, that there was no worldly thing on Earth, more worthy to be known, than the Estate of that happy Land. But above all (*we said*) since that we were met from the several Ends of the World, and hoped assuredly, that we should meet one day in the Kingdom of Heaven, (for that we were both parts *Christians*) we desired to know (in respect that Land was so remote, and so divided by vast and unknown Seas, from the Land where our *Saviour* walked on Earth) who was the Apostle of that Nation, and how it was converted to the Faith. *It appeared in his face, that he took great contentment in this our Question. He said*, Ye knit my Heart to you by asking this Question in the first place, for it sheweth that you *first seek the Kingdome of Heaven*; and I shall gladly and briefly satisfie your demand.

About twenty years after the Ascension of our *Saviour*, it came to pass, that there was seen by the people of *Renfusa* (a City upon the Eastern Coast of our Island) within night (the Night was cloudy and calm) as it might be, some miles in the Sea, a great *Pillar of Light*, not sharp, but in form of a Column or Cylinder, rising from the Sea a great way up towards Heaven, and on the top of it was seen a large *Cross of Light*, more bright and resplendent than the Body of the Pillar: Upon which so strange a spectacle the people of the City gathered apace together upon the Sands to wonder, and so after put themselves into a number of small Boats to go nearer to this marvellous sight. But when the Boats were come within (about) sixty yards of the Pillar, they found themselves all bound and could go no further, yet so as they might move to go about, but might not approach nearer; so as the Boats stood all as in a Theater, beholding this Light as an Heavenly Sign. It so fell out, that there was in one of the Boats, one of the Wise men of the Society of *Solomons House*, (which *House* or *Colledge* (my good Brethren) is the very eye of this Kingdom) who having a while attentively and devoutly viewed and contemplated this Pillar and Cross, tell down upon his face, and then raised himself upon his knees, and lifting up his hands to Heaven made his Prayers in this manner,

Lord God of Heaven and Earth, thou hast vouchsafed of thy Grace to those of our Order, to know thy Works of Creation, and true Secrets of them, and to discern (as far as appertaineth to the Generations of Men) between Divine Miracle, Works of Nature, Works of Art, and Impostures and Illusions of all sorts. I do bere acknowledge and testifie before this People, that the Thing

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we now see before our eyes is thy Finger, and a true Miracle. And forasmuch as we learn in our Books, that thou never workest Miracles but to a Divine and excellent end, (for the Laws of Nature, are thine own Laws, and thou exceedest them not but upon good cause) we most humbly beseech thee to prosper this great Sign, and to give us the Interpretation, and use of it in mercy, which thou dost in some part secretly promise, by sending it unto us.

When he had made his prayer, he presently found the Boat he was in moveable and unbound, whereas all the rest remained still fast; and taking that for an assurance of leave to approach, he caused the Boat to be softly and with silence, rowed toward the Pillar; but ere he came near it, the Pillar and Cross of Light brake up, and cast it self abroad, as it were, into a Firmament of many Stars, which also vanished soon after, and there was nothing left to be seen but a small Ark or Chest of Cedar, dry, and not wet at all with Water, though it swam; and in the fore end of it, which was towards him, grew a small green Branch of Palm. And when the Wiseman had taken it with all reverence into his Boat, it opened of it self, and there was found in it a Book and a Letter, both written in fine Parchment, and wrapped in Sindons of Linnen. The Book contained all the Canonical Books the Old and New Testament, according as you have them, (for we know well what the Churches with you receive,) and the Apocalypse it self, and some other Books of the New Testament, which were not at that time written, were nevertheless in the Book. And for the Letter, was in these words.

I Bartholomew, a Servant of the Highest, and Apostle of JESUS CHRIST, was warned by an Angel that appeared to me in a Vision of Glory, that I should commit this Ark to the Flouds of the Sea. Therefore I do testifie and declare unto that People, where GOD shall ordain his Ark to come to Land, that in the same day is come unto them Salvation, and Peace, and Good will from the FATHER, and from the LORD JESUS.

There was also in both these Writings, as well the Book as the Letter, wrought a great Miracle, conform to that of the Apostles in the Original Gift of Tongues. For there being at that time in this Land Hebrews, Persians, and Indians, besides the Natives; every one read upon the Book
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and *Letter*, as if they had been written in his own Language. And thus was this Land saved from Infidelity (as the Remain of the old World was from water) by an Ark; through the Apostolical and Miraculous Evangelism of St. *Bartholomew*. And here he paused, and a Messenger came and called him forth from us. So this was all that passed in that Conference.

The next day the same Governor came again to us immediately after Dinner, and excused himself, saying, 'That the day before he was called from us somewhat abruptly, but now he would make us amends, and spend time with us, if we held his Company and Conference agreeable. *We answered*, 'That we held it so agreeable and pleasing to us, as we forgot both dangers past and fears to come, for the time we heard him speak, and that we thought an hour spent with him, was worth years of our former life. *He bowed himself a little to us, and after we were set again, he said*, 'Well the Questions are on your part. *One of our number said, after a little pause*. 'That there was a matter we were no less desirous to know then fearful to ask, lest we might presume too far; but encouraged by his rare Humanity towards us (that could scarce think our selves strangers, being his vowed and professed Servants) we would take the hardiness to propound it: humbly beseeching him, if he thought it not fit to be answered, that he would pardon it, though he rejected it. *We said*, We well observed those his Words which he formerly spake, That this happy Island where we now stood was known to few, and yet knew most of the Nations of the World, which we found to be true, considering they had the Languages of *Europe*, and knew much of our state and business; and yet we in *Europe* (notwithstanding all the remote Discoveries and Navigations of this last Age) never heard any of the least inkling or glimpse of this Island. This we found wonderful strange, for that all Nations have interknowledge one of another, either by Voyage into Foreign Parts, for by strangers that come to them: And though the Traveller into a Foreign Countrey, doth commonly know more by the Eye, then he that staid at home can by relation of the Traveller; yet both ways suffice to make a mutual knowledge in some degree on both parts: But for this Island, we never heard tell of any Ship of theirs that had been seen to arrive upon any shore of *Europe*, no nor of either the *East* or *West-Indies*, nor yet of any Ship of any other part of the World that had made return for them. And yet the marvel rested not in this; for the situation of it (as his Lordship said) in the secret Conclave of such a vast Sea might cause it: But then, that they should have knowledge of the Languages, Books, Affairs of those that lye such a distance from them, it was a thing we could not tell what to make of; for that it seemed to us a condition and propriety of Divine Powers and Beings, to be hidden and unseen to others, and yet to have others open, and as in a light to them. At his Speech the Governor gave a gracious smile, and said, 'That we did well to ask pardon for this Question we now asked, for that it imported as if we thought this Land, a Land of Magicians, that sent forth spirits of the Air into all parts to bring them news, and intelligence of other Countreys. It was answered by us all, in all possible humbleness, but yet with a countenance taking knowledge, that we knew, that he spake it but merrily, 'That we were apt enough to think, there was somewhat supernatural in this Island, but yet rather as Angelical than Magical. But to let his Lordship know truly what it was that made us tender and doubtful to ask this Question,

Question; it was not any such conceit, but because we remembred he had given a touch in his former Speech, that this Land had Laws of Secrecy, touching Strangers To this he said: You remember it aright; and therefore in that, I shall say to you, I must reserve some particulars which it is not lawful for me to reveal, but there will be enough left to give you satisfaction.

You shall understand (that which perhaps you will scarce think credible) that about Three thousand years ago or somewhat more, the Navigation of the World (especially for remote Voyages) was greater then at this day. Do not think with your selves, that I know not how much it is increased with you within these sixscore years, I know it well; and yet I say, greater then, than now. Whether it was, that the example of the Ark that saved the remnant of Men from the Universal Deluge gave men confidence to adventure upon the Waters, or what it was, but such is the truth. The Phœnicians, and specially the Tyrians, had great Fleets; so had the Carthaginians their Colony, which is yet further West: Toward the East, the shipping of Egypt, and of Palestina was likewise great: China also, and the great Atlantis (that you call America) which have now but Junks and Canoaes, abounded then in tall ships. This Island (as appeareth by faithful Registers of those times) had then Fifteen hundred strong Ships of great content. Of all this, there is with you sparing memory or none, but we have large knowledge thereof.

At that time this Land was known, and frequented by the Ships and Vessels of all the Nations before named, and (as it cometh to pass) they had many times Men of other Countreys that were no Sailers, that came with them, as Persians, Caldeans, Arabians, so as almost all Nations of might and fame resorted hither, of whom we have some stirps and little Tribes with us this day. And for our own Ships, they went sundry, Voyages, as well to your Streights, which you call the Pillars of Hercules, as to other parts in the Atlantick and Mediterranean Seas; as to Pagan (which is the same with Cambalu) and Quinsay upon the Oriental Seas, as far as to the Borders of the East Tartary.

At the same time, and an Age after or more, the Inhabitants of the great Atlantis did flourish. For though the Narration and Description which is made by a great Man with you, that the Descendents of Neptune planted there, and of the magnificent Temple, Palace, City and Hill, and the manifold streams of goodly Navigable Rivers, (which as so many Chains invironed the same Site and Temple,) and the severall degrees of ascent, whereby men did climb up to the same, as if it had been a Scala Celi, be all Poetical and Fabulous; yet so much is true, That the said Countrey of Atlantis, as well that of Peru then called Coja, as that of Mexico then named Tyrambel, were mighty and proud Kingdoms in Arms, Shipping, and Riches; so mighty, as at one time (or at least within the space of ten years) they both made two great expeditions, they of Tyrambel through the Atlantick to the Mediterranean Seas, and they of Coja through the South-sea upon this our Island. And for the former of these which was into Europe, the same Author amongst you (as it seemeth) had some relation from the Egyptian Priest whom he citeth for assuredly such a thing there was. But whether it were the ancient Athenians that had the glory of the repulse and resistance of those Forces, I can say nothing; but certain it is, there never came back either Ship or man from that Voyage. Neither had the other Voyage of those of Coja, upon us, had better fortune

fortune, if they had not met with enemies of greater clemency. For the
 King of this Island (by name *Atabin*) a wise Man, and a great Warrior,
 knowing well both his own strength, and that of his enemies, handled the
 matter so, as he cut off their Land forces from their Ships, and entailed
 both their Navy and their Camp, with a greater power than theirs, both
 by Sea and Land, and compelled them to render themselves without
 striking stroke; and after they were at his mercy, contenting himself on-
 ly with their Oath, that they should no more bear Arms against him, dis-
 missed them all in safety. But the *Divine revenge* overtook not long
 after those proud interprises; for within less then the space of One hun-
 dred years the *Great Atlantis* was utterly lost and destroyed, not by a great
 Earthquake, as your *Man* saith, (for that whole Tract is little subject to
 Earthquakes) but by a particular Deluge and Inundation, those Countreys
 having at this day far greater Rivers, and far higher Mountains to pour
 down Waters, than any part of the Old World. But it is true, that the
 same Inundation was not deep, not past Forty Foot in most places from
 the ground; so that although it destroyed Man and Beast generally,
 yet some few wilde Inhabitants of the Wood escaped: Birds also were
 saved by flying to the high Trees and Woods. For as for Men, although
 they had Buildings in many places higher then the depth of the Water;
 yet that Inundation, though it were shallow, had a long continuance,
 whereby they of the Vale, that were not drowned, perished for want of
 Food, and other things necessary. So as marvel you not at the thin Po-
 pulation of *America*, nor at the Rudeness and Ignorance of the People: for
 you must account your Inhabitants of *America* as a young People,
 younger a thousand years at the least than the rest of the World, for
 that there was so much time between the Universal Flood, and their par-
 ticular Inundation. For the poor remnant of Humane Seed which re-
 mained in their Mountains peopled the Countrey again slowly, by little
 and little. And being simple and savage people (not like *Noah* and his
 Sons, which was the chief Family of the Earth) they were not able to
 leave Letters, Arts, and Civility to their Posterity. And having likewise
 in their Mountainous Habitations been used (in respect of the extream
 Cold of those *Regions*) to cloath themselves with the skins of Tigers,
 Bears and great Hairy Goats, that they have in those parts; when after
 they came down into the Valley, and found the intolerable Heats which
 are there, and knew no means of lighter Apparel, they were forced to
 begin the custom of going naked, which continueth at this day, onely
 they take great pride and delight in the Feathers of Birds: And this also
 they took from those their Ancestors of the Mountains, who were in-
 vited unto it by the infinite flight of Birds that came up to the High
 Grounds, while the Waters stood below. So you see by this main
 accident of time, we lost our Traffick with the *Americans*, with whom
 of all others, in regard they lay nearest to us, we had most commerce.
 As for the other parts of the World, it is most manifest, that in the
 Ages following (whether it were in respect of Wars, or by a Natural
 revolution of time) Navigation did every where greatly decay, and
 especially far Voyages (the rather by the use of Gallies and such Vessels
 as could hardly brook the Ocean) were altogether left and omitted.
 So then, that part of entercourse which could be from other Nations
 to sail to us, you see how it hath long since ceased, except it were by
 some rare accident, as this of yours. But now of the cessation of that

other

other part of entercourse, which might be by our sailing to other Nations. I must yield you some other cause: for I cannot say (if I shall say truly) but our shipping for number, strength, Mariners, Pilots, and all things that appertain to Navigation, is as great as ever; and therefore why we should sit at home, I shall now give you an account by it self, and it will draw nearer to give you satisfaction to your principal Question.

There reigned in this Island about One thousand nine hundred years ago, a King, whose memory of all others we most adore, not superstitiously but as a Divine Instrument, though a Mortal Man; his name was *Solamona*, and we esteem him as the *Law-giver* of our Nation. This King had a large heart, inscrutable for good, and was wholly bent to make his Kingdom and People happy: He therefore taking into consideration how sufficient and substantive this Land was to maintain it self without any aid (at all) of the Forreigner, being Five thousand six hundred miles in circuit, and of rare fertility of soil in the greatest part thereof; and finding also the shipping of this Country might be plentifully set on work, both by Fishing, and by Transportations from Port to Port, and likewise by sailing unto some small Islands that are not far from us, and are under the Crown and Laws of this State; and recalling into his memory the happy and flourishing estate wherein this Land then was, so as it might be a thousand ways altered to the worse, but scarce any one way to the better; thought nothing wanted to his Noble and Heroical Intentions, but onely (as far as Humane foresight might reach) to give perpetuity to that which was in his time so happily established; therefore amongst his other Fundamental Laws of this Kingdom, he did ordain the Interdicts and Prohibitions which we have touching entrance of strangers, which at that time (though it was after the calamity of *America*) was frequent, doubting novelties and commixture of manners. It is true, the like Law against the admission of strangers, without licence, is an ancient Law in the Kingdom of *China*, and yet continued in use; but there it is a poor thing, and hath made them a curious, ignorant, fearful, foolish Nation. But our *Law-giver* made his Law of another temper. For first, he hath preserved all points of humanity, in taking order and making provision for the relief of strangers distressed, whereof you have tasted. At which Speech (as reason was) we all rose up and bowed our selves. He went on. That King also still desiring to joyn Humanity and Policy together, and thinking it against Humanity to detain Strangers here against their Wills, and against Policy, that they should return and discover their knowledge of this his State, he took this course. He did ordain, that of the Strangers that should be permitted to Land, as many (at all times) might depart as would, but as many as would stay, should have very good conditions and means to live from the State. Wherein he saw so far, that now in so many Ages, since the Prohibition, we have memory not of one Ship that ever returned, and but of thirteen persons onely at several times that chose to return in our Bottoms. What those few that returned, may have reported abroad, I know not; but you must think, whatsoever they have said, could be taken where they came, but for a dream. Now for our travelling from hence into parts abroad, our *Law-giver* thought fit altogether to restrain it. So is it not in *China*, for the *Chineses* sail where they will or can; which sheweth, that their Law of keeping out Strangers, is a Law of pusillanimity and fear. But this restraint of ours hath one onely exception, which is admirable, preserving the good which cometh by communicating with strangers, and avoiding the hurt; and I will now

open it to you. And here I shall seem a little to digress, but you will by and by find it pertinent. Ye shall understand (my dear Friends) that amongst the excellent acts of that King, one above all hath the preeminence: It was the erection and institution of an *Order* or *Society* which we call *Salomons House*, the noblest Foundation (as we think) that ever was upon the Earth, and the Lanthorn of this Kingdom. It is dedicated to the study of the *Works* and *Creatures* of *God*. Some think it beareth the Founders name a little corrupted, as if it should be *Solamona's House*; but the Records write it as it is spoken, so as I take it to be denominated of the *King* of the *Hebrews*, which is famous with you and no stranger to us, for we have some parts of his Works, which with you are lost, namely that *Natural History*, which he wrote of all *Plants* from the *Cedar of Libanus*, to the *Moss* that groweth out of the *Wall*; and of all things that have *Life* and *Motion*. This maketh me think, that our *King* finding himself to Symbolize, in many things with that *King* of the *Hebrews* (which lived many years before him) honoured him with the Title of this foundation, and I am the rather induced to be of this opinion, for that I find in ancient record; this *Order* or *Society* is sometimes called *Salomons House*; and sometimes the *Colledge* of the *six days Works*: whereby I am satisfied, That our excellent *King* had learned from the *Hebrews*, that *God* had created the World, and all that therein is, within six Days, and therefore he instituting that *House* for the finding out of the true Nature of all things (whereby *God* might have the more Glory in the Workmanship of them, and Men the more fruit in the use of them) did give it also that second name. But now to come to our present purpose. When the *King* had forbidden, to all his people navigation into any part that was not under his Crown, he made nevertheless this Ordinance; That every twelve years there should be set forth out of this *Kingdom* two Ships appointed to several Voyages; that in either of these Ships there should be a Mission of three of the *Fellows* or *Brethren* of *Solamons House* whose errand was onely to give us knowledge of the affairs and state of those Countreys, to which they were designed, and especially of the Sciences, Arts, Manufactures and Inventions of all the World; and withal to bring unto us Books, Instruments, and Patterns in every kind. That the Ships after they had landed the *Brethren* should return, and that the *Brethren* should stay abroad till the new Mission. The Ships are not otherwise fraught than with store of Victuals, and good quantity of Treasure to remain with the *Brethren* for the buying of such things, and rewarding of such persons as they should think fit. Now for me to tell you how the vulgar sort of Marriners are contained from being discovered at Land, and how they that must be put on shore for any time colour themselves under the names of other Nations; and to what place these Voyages have been designed, and what places of *Rendezvous* are appointed for the new Missions and the like circumstances of the practick, I may not do it, neither is it much to your desire. But thus you see we maintain a Trade, not for Gold, Silver, or Jewels, nor for Silks, nor for Spices, nor any other commodity of Matter, but onely for *Gods* first Creature, which was *Light*; to have *Light* (I say) of the growth of all parts of the World. And when he had said this he was silent, & so were we all; for indeed, we were all astonished to hear so strange things so probably told. And he perceiving, that we were willing to say somewhat, but had it not ready, in great courtesie took us off, and descended to ask us questions of our Voyage and Fortunes, and in the end concluded that we might do well, to think with our selves,

what

and in the end concluded, that we might do well to think with our selves what time of stay we would demand of the State; and bade us not to scant our selves, for he would procure such time as we desired. Whereupon we all rose up and presented our selves to kiss the skirt of his Tippet; but he would not suffer us, and so took his leave. But when it came once amongst our people, that the State used to offer conditions to strangers that would stay, we had work enough to get any of our men to look to our Ship, and to keep them from going presently to the Governor to crave conditions; but with much ado, we refrained them till we might agree what course to take.

We took our selves now for Freemen, seeing there was no danger of our utter perdition, and lived most joyfully, going abroad, and seeing what was to be seen in the City and places adjacent within our *Tedder*, and obtaining acquaintance with many of the City, not of the meanest quality, at whose hands we found such humanity, and such a freedom and desire to take strangers, as it were into their bosome, as was enough to make us forget all that was dear to us in our own Countreys, and continually we met with many things right worthy of observation and relation: as indeed, if there be a Mirror in the World, worthy to hold mens eyes, it is that Countrey. One day there were two of our company bidden to a *Feast* of the *Family*, as they call it; a most natural, pious and reverend custom it is, shewing that Nation to be compounded of all goodness. This is the manner of it. It is granted to any man that shall live to see thirty persons descended of his body alive altogether, and all above three years old, to make this *Feast*, which is done at the cost of the State. The *Father* of the *Family*, whom they call the *Tirsan*, two days before the *Feast* taketh to him three of such Friends as he liketh, to chuse, and is assisted also by the Governor of the City or place where the *Feast* is celebrated; and all the *Persons* of the *Family*, of both Sexes are summoned to attend him. These two days the *Tirsan* sitteth in consultation concerning the good estate of the *Family*; there, if there be any Discords or Suits between any of the *Family*, they are compounded and appeased; there, if any of the *Family* be distressed or decayed, order is taken for their relief and competent means to live; there, if any be subject to vice or take ill courses, they are reprov'd and censured. So likewise, direction is given touching Marriages, and the courses of life which any of them should take, with divers other the like orders and advices. The Governor assisteth to the end, to put in execution by his publick Authority, the Decrees and Orders of the *Tirsan*, if they should be disobeyed, though that seldom needeth, such reverence and obedience they give to the order of Nature. The *Tirsan* doth also then ever chuse one man from amongst his Sons to live in House with him, who is called ever after the *Son of the Vine*; the reason will hereafter appear. On the *Feast-day* the *Father* or *Tirsan* cometh forth after Divine Service into a large Room where the *Feast* is celebrated; which Room hath an Halfpace at the upper end. Against the Wall, in the middle of the Halfpace, is a Chair placed for him, with a Table and Carpet before it: Over the Chair is a State made round or oval, and it is of Ivy; an Ivy somewhat whiter then ours, like the Leaf of a silver Asp, but more shining, for it is Green all Winter. And the State is curiously wrought with Silver and Silk of divers colours, broyding or binding in the Ivy; and is ever of the work of some of the Daughters of the *Family*, and veiled

over at the top with a fine Net of Silk and Silver: But the substance of it is true Ivy, whereof, after it is taken down, the Friends of the Family are desirous to have some Leaf or Sprig to keep. The *Tirfan* cometh forth with all his Generation or Lineage, the Males before him, and the Females following him. And if there be a Mother, from whose body the whole Lineage is descended, there is a Traverse placed in a Loft above on the right hand of the Chair, with a Privy-door, and a carved Window of Glass leaded with Gold and Blew, where she sitteth, but is not seen. When the *Tirfan* is come forth, he sitteth down in the Chair, and all the Lineage place themselves against the Wall, both at his back, and upon the return of the Half-space, in order of their years, without difference of Sex, and stand upon their Feet. When he is set, the room being always full of company, but well kept, and without disorder, after some pause there cometh in from the lower end of the room a *Taratan*, (which is as much as an *Herauld*) and on either side of him two *Young Lads*, whereof one carrieth a Scroul of their shining yellow Parchment, and the other a cluster of Grapes of Gold, with a long Foot or Stalk: The *Herauld* and *Children* are clothed with Mantles of Sea-water-green sattin, but the *Heraulds* Mantle is streamed with Gold, and hath a Train. Then the *Herauld*, with three Courtesies, or rather inclinations, cometh up as far as the Half-space, and there first taketh into his hand the Scroul. This Scroul is the *Kings Charter*, containing Gift of Revenue, and many Priviledges, Exemptions, and Points of Honor granted to the *Father* of the *Family*; and it is ever stiled and directed, *To such an one. Our well-beloved Friend and Creditor*, which is a Title proper onely to this case: For they say, the King is Debtor to no Man, but for propagation of his Subjects. The Seal set to the *Kings Charter*, is the Kings Image imbossed or moulded in Gold. And though such *Charters* be expedited of course, and as of right, yet they are varied by discretion, according to the number and dignity of the *Family*. This *Charter* the *Herauld* readeth aloud and while it is read, the *Father* or *Tirfan* standeth up, supported by two of his Sons, such as he chuseth. Then the *Herauld* mounteth the Half-space, and delivereth the *Charter* into his hand, and with that there is an acclamation by all that are present in their Language, which is thus much, *Happy are the People of Bensalem*. Then the *Herauld* taketh into his hand from the other Child the Cluster of Grapes, which is of Gold, both the Stalks and the Grapes; but the Grapes are daintily enamelled: And if the Males of the *Family* be the greater number, the Grapes are enamelled Purple, with a little Sun set on the top; if the Females, then they are enamelled into a greenish yellow, with a Crescent on the top. The Grapes are in number as many as there are Descendants of the *Family*. This Golden Cluster the *Herauld* delivereth also to the *Tirfan*, who presently delivereth it over to that Son that he had formerly chosen to be in house with him; who beareth it before his *Father* as an Ensign of Honor when he goeth in publick ever after, and is thereupon called *The Son of the Vine*. After this Ceremony ended, the *Father* or *Tirfan* retireth, and after some time cometh forth again to Dinner, where he sitteth alone under the State as before; and none of his Descendants sit with him; of what degree or dignity soever, except he hap to be of *Salomons House*. He is served onely by his own Children, such as are Male, who perform unto him all service of the Table upon the Knee; and the Women onely stand about him, leaning against the Wall. The Room below the Half-space hath

hath Tables on the sides for the Guests that are bidden, who are served with great and comely order; and toward the end of Dinner (which in the greatest Feasts with them, lasteth never above an Hour and a Half) there is an *Hymn* sung, varied according to the Invention of him that composed it, (for they have excellent Poetrie;) but the subject of it is (always) the praises of *Adam*, and *Noah*, and *Abraham*; whereof the former two peopled the World, and the last was the *Father* of the *Faithfuls*, concluding ever with a Thanksgiving for the *Nativity* of our *Saviour* in whose Birth the Births of all are onely Blessed. Dinner being done, the *Tirisan* retireth again, and having withdrawn himself alone into a place, where he maketh some private Prayers, he cometh forth the third time to give the Blessing, with all his Descendants, who stand about him as at the first. Then he calleth them forth, by one and by one, by name, as he pleaseth, though seldom the order of age be inverted. The person that is called (the Table being before removed) kneeleth down before the Chair, and the *Father* layeth his hand upon his head, or her head, and giveth the Blessing in these words, *Son of Bensalem (or Daughter of Bensalem) thy Father saith it, the Man by whom thou hast breath and life speaketh the word: the Blessing of the everlasting Father, the Prince of Peace, and the Holy Dove be upon thee, and make the days of thy Pilgrimage good and many.* This he saith to every of them; and that done, if there be any of his Sons of eminent Merit and Vertue, (so they be not above two) he calleth for them again, and saith, laying his arm over their shoulders, they standing, *Sons, it is well you are born; give God the praise, and persevere to the end.* And withal delivereth to either of them a Jewel, made in the figure of an Ear of Wheat, which they ever after wear in the front of their Turbant or Hat. This done, they fall to Musick and Dances and other Recreations after their manner, for the rest of the day. This is the full order of that *Feast*.

By that time six or seven days were spent, I was faine into straight acquaintance with a *Merchant* of that *City*, whose name was *Joabin*; he was a *Jew*, and *circumcised*: For they have some few stirps of *Jews* yet remaining among them, whom they leave to their own Religion; which they may the better do, because they are of a far differing disposition from the *Jews* in other parts. For whereas they hate the Name of *CHRIST*, and have a secret imbred rancor against the people, among whom they live: These (contrariwise) give unto our *SAVIOUR* many high Attributes, and Love the *Nation* of *Bensalem* extreamly. Surely this Man, of whom I speak, would ever acknowledge that *CHRIST* was born of a *Virgin*, and that he was more then a Man; and he would tell how *GOD* made him Ruler of the *Seraphims* which guard his Throne, and they call him also the *Milken way*, and the *Eliab* of the *Messiah*, and many other high Names; which though they be inferior to his Divine Majesty, yet they are far from the Language of other *Jews*. And for the Countrey of *Bensalem*, this Man would make no end of commending it, being desirous, by Tradition among the *Jews* there, to have it believed, that the people thereof were of the Generations of *Abraham* by another Son, whom they call *Nachoran*; and that *Moses* by a secret *Cabala* ordained the Laws of *Bensalem*, which they now use; and that when the *Messiah* should come and sit in his Throne at *Jerusalem*, the King of *Bensalem* should sit at his Feet, whereas others Kings should keep a great distance. But yet setting aside these Jewish Dreams, the Man was a wise man and learned, and of great Policy, and excellently seen in the Laws and Customs of that Nation.

Nation. Amongst other discourses, one day I told him, I was much affected with the Relation I had from some of the Company of their Custom in holding the *Feast of the Family*, for that (me thought) I had never heard of a Solemnity wherein Nature did so much preside. And because Propagation of Families proceedeth from the Nuptial Copulation, I desired to know of him what Laws and Customs they had concerning Marriage, and whether they kept Marriage well, and whether they were tied to one Wife. For that where Population is so much affected, and such as with them it seemed to be, there is commonly permission of *Plurality of Wives*. To this he said, *You have reason for to command that excellent Institution of the Feast of the Family; and indeed we have experience, that those Families that are partakers of the Blessings of that Feast do flourish and prosper ever after in an extraordinary manner. But hear me now, and I will tell you what I know. You shall understand, that there is not under the Heavens, so chaste a Nation as this of Bensalem, nor so free from all pollution or foulness; it is the Virgin of the World. I remember I have read in one of your European books of an holy Hermit amongst you that desired to see the Spirit of fornication and there appeared to him a little foul ugly Æthiope: But if he had desired to see the Spirit of Chastity of Bensalem, it would have appeared to him in the likeness of a fair beautiful Cherubim; for there is nothing amongst Mortal Men more fair and admirable, then the chaste Minds of this People. Know therefore, that with them there are no Stewy, no dissolute Houses, no Courtisans, nor any thing of that kind. Nay they wonder (with detestation) at you in Europe, which permit such things. They say you have put Marriage out of office; for Marriage is ordeined a remedy for unlawful concupiscence, and Natural concupiscence seemeth as a spur to Marriage: But when Men have at hand a remedy more agreeable to their corrupt will, Marriage is almost expelled. And therefore, there are with you seen infinite Men that marry not, but chuse rather a Libertine, and impure single Life, then to be yoked in Marriage; and many that do marry, marry late, when the prime and strength of their years is past; and when they do marry, what is Marriage to them, but a very bargain, wherein is sought Alliance, or Portion, or Reputation, with some desire (almost indifferent) of issue, and not the faithful Nuptial Union of Man and Wife that was first instituted? Neither is it possible, that those that have cast away so basely so much of their strength, should greatly esteem Children (being of the same matter) as chaste Men do. So likewise during Marriage is the case much amended, as it ought to be, if those things were tolerated onely for necessity? No, but there remains still as a very affront to Marriage, the haunting of those dissolute places, or resort to Courtisans, are no more punish in Married men, then in Batchelors: And the depraved custome of change, and the delight in meretricious embraces, (where Sin is turned into Art) maketh Marriage a dull thing and a kind of Imposition or Tax. They hear you defend these things as done to avoid greater evils, as Advowtries, Desflouring of Virgins, Unnatural Lust, and the like: But they say this is a preposterous Wisdom; and they call it Lots offer, who to save his Guests from abusing offered his Daughters: Nay, they say further, that there is little gained in this, for that the same Vices and Appetites do still remain and abound, Unlawful Lust being like a Furnace, that if you stop the Flames altogether*

gether, it will quench; but if you give it any vent, it will rage. As for Masculine Love, they have no touch of it, and yet there are not so faithful and inviolate Friendships in the World again as are there; and to speak generally (as I said before) I have not read of any such Chastity in any People as theirs. And their usual saying is, that whosoever is unchaste, cannot reverence himself. And they say, That the reverence of a Mans self is, next religion, the chiefest Bridle of all Vices. And when he had said this, the good Jew paused a little. Whereupon, I far more willing to hear him speak on, than to speak my self; yet thinking it decent, that upon his pause of Speech I should not be altogether silent, said onely this; That I would say to him, as the Widow of Sarepta said to Elias, That he was come to bring to memory our sins; and that I confesse the Righteousness of Bensalem was greater than the Righteousness of Europe. At which Speech he bowed his Head, and went on this manner. They have also many wise and excellent Laws touching Marriage; they allow no Polygamy; they have ordained that none do intermarry or contract until a month be past from their first interveiw. Marriage without consent of Parents, they do not make void, but they mulct it in the Inheritors; for the Children of such Marriages are not admitted to inherit above the third part of their Parents inheritance. I have read in a Book of one of your Men, of a Feigned common-wealth, where the married couple are permitted before they contract to see one another naked. This they dislike, for they think it a Scorn to give a refusal after so familiar knowledge; but because of many hidden defects in Men and Womens Bodies, they have a more civil way for they have near every Town, a couple of Pools (which they call Adam and Eves Pools) where it is permitted to one of the Friends of the Man, and another of the Friends of the Woman, to see them severally, both naked.

And as we were thus in Conference, there came one that seemed to be a Messenger, in a rich Huke, that spake with the Jew; whereupon he turned to me, and said, You will pardon me, for I am commanded away in haste; the next morning he came to me again, joyful, as it seemed, and said there is word come to the Governor of the City, that one of the Fathers of Salomons House will be here this day seven night; we have seen none of them this dozen years. His coming is in state, but the cause of his coming is secret. I will provide you and your Fellows of a good standing to see his entry. I thanked him, and told him, I was most glad of the news. The Day being come, he made his entry. He was a Man of middle stature and Age, comely of person, and had an aspect as if he pitied men; He was cloathed in a Robe of fine black Cloth, with White Sleeves, and a Cape. His under Garment was of excellent white Linnen down to the Foot, girt with a Girdle of the same; and a Sindon or Tippet of the same about his Neck; he had Gloves that were curious, and set with Stone, and shoes of Peach-coloured Velvet; his Neck was bare to the Shoulders; his Hat was like a Helmet or Spanish Montera, and his Locks curled below it decently, they were of colour brown; his Beard was cut round, and of the same colour with his Hair, somewhat lighter. He was carried in a rich Chariot without Wheels, Litter-wise, with two Horses at either end, richly trapped in blew Velvet embroidered, and two Footmen on each side in the like attire. The Chariot was all of Cedar guilt, and adorned with cristall save that the fore-end had Pannells of Saphires set in borders of Gold; And the Hinder-end the like of Emeralds of the Peru colour. There

There was also a Sun of Gold, radiant upon the top in the midst and on the top before a small *cherub* of Gold, with Wings displayed. The Chariot was covered with Cloth of Gold tissued upon blew. He had before him fifty attendants, young men all, in white Satten loose Coats to the mid-leg, and stockings of white Silk, and Shooes of blew Velvet, and Hats of blew Velvet, with fine Plumes of divers Colours, set round like Hat.bands. Next before the Chariot, went two Men, bare headed, in Linnen Garments down to the foot, girt, and Shoes of blew Velvet; who carried, the one a Crosier, the other a Pastoral Staff like a Sheep-hook, neither of them of Metal, but the Crosier of Balm-wood, the Pastoral Staff of Cedar. Horsemen he had none, neither before, nor behind his Chariot, as it seemeth, to avoid all tumult and trouble. Behind his Chariot went all the Officers and Principals of the Companies of the City. He sat alone upon Cushions, of a kind of excellent Plush, blew, and under his Foot curious Carpets of Silk of divers colours, like the *Persian*, but far finer. He held up his bare hand as he went, as blessing the People, but in silence. The Street was wonderfully well kept, so that there was never any Army had their Men stand in better battell-array, then the people stood. The Windows likewise were not crowded but every one stood in them, as if they had been placed. When the show was past, the Jew said to me, 'I shall not be able to attend you as I would, in regard of some charge the City hath laid upon me for the entertaining of this great Person. Three days after the Jew came to me again, and said, Ye are happy men, for the Father of Solomons House taketh knowledge of your being here, and commanded me to tell you, that he will admit all your company to his presence, and have private conference with one of you that ye shall chuse; and for this, hath appointed the next day after to morrow. And because he meaneth to give you his Blessing, he hath appointed it in the forenoon. We came at our day and hour, and I was chosen by my fellows for the private access. We found him in a fair Chamber richly hanged and carpeted under Foot, without any degree to the State: He was set upon a low Throne, richly adorned, and a rich Cloth of State over his head of blew Sattin embroidered. He was alone, save that he had two Pages of Honor on either hand one, finely attired in white. His under Garments were the like, that we saw him wear in the Chariot; but instead of his Gown, he had on him a Mantle with a Cape of the same fine Black, fastned about him. When we came in, as we were taught, we bowed low at our first entrance; and when we were come near his Chair, he stood up, holding forth his hand ungloved, and in posture of Blessing; and we every one of us stooped down and kissed the Hem of his Tippet. That done, the rest departed, and I remained. Then he warned the Pages forth of the Room, and caused me to sit down beside him, and spake to me thus in the *Spanish Tongue*.

GOD

GOD Bless thee, my Son, I will give thee the greatest Jewel I have: for I will impart unto thee, for the love of God and Merit, a Relation of the true state of *Salomons House*. Son, to make you know the true state of *Solomons House*, I will keep this order. First, I will set forth unto you the *End* of our *Foundation*. Secondly, The *Preparations* and *Instruments* we have for our *Works*. Thirdly, The several *Employments* and *Functions* whereto our *Fellows* are assigned: And fourthly, The *Ordinances* and *Rites* which we observe.

The *End* of our *Foundation*, is the Knowledge of *Causes* and Secret *Motions* of things, and the enlarging of the Bounds of *Humane Empire*, to the effecting of all things possible.

The *Preparations* and *Instruments*, are these. We have large and deep *Caves* of several deeps, the deepest are sunk six hundred fathom, and some of them are digged and made under great Hills and Mountains: so that if you reckon together the depth of the Hill, and the depth of the *Cave*, they are (some of them) above three miles deep: For we find that the depth of an Hill, and the depth of a *Cave* from the Flat, is the same thing, both remote alike from the Sun and Heavens Beams, and from the open Air. These *Caves* we call the *Lower Region*, and we use them for all *Coagulations*, *Indurations*, *Refrigerations*, and *Conservations* of *Bodies*. We use them likewise for the *Imitation* of *Natural Mines*, and the *Producing* also of new *Artificial Metals*, by *Compositions* and *Materials* which we use and lay there for many years. We use them also sometimes (which may seem strange) for *Curing* of some *Diseases*, and for *prolongation* of life in some *Hermits* that chuse to live there, well accommodated of all things necessary, and indeed live very long; by whom also we learn many things.

We have *Burials* in several *Earths*, where we put divers *Cements* as the *Chineses* do their *Porcellane*; but we have them in greater variety and some of them more fine. We also have great variety of *Composts* and *Soils* for the making of the Earth fruitful.

We have high *Towers*, the highest about half a Mile in Height, and some of them likewise set upon high *Mountains*, so that the vantage of the Hill with the *Tower*, is in the Highest of them, three Miles at least. And these places we call the *Upper Region*, accounting the Air, between the *High places* and the *Low*, as a *Middle Region*. We use these *Towers* according to their several heights and situations, for *Insolations*, *Refrigeration*, *Conservation*, and for the view of divers *Meteors*, as *Winds*, *Rain*, *Snow*, *Hail*, and some of the Fiery *Meteors* also. And upon them, in some places, are dwellings of *Hermits*, whom we visit sometimes, and instruct what to observe.

We have great *Lakes*, both salt and fresh, whereof we have use for the *Fish* and *Fowl*. We use them also for *Burials* of some *Natural Bodies*; for we find a difference in things buried in *Earth*, or in *Air* below the *Earth*, and things buried in *Water*. We have also *Pools*, of which some do strain *Fresh water* out of *Salt*, and others by Art do turn *Fresh water* into *Salt*. We have also some *Rocks* in the midst of the *Sea*, and some *Bays* upon the *Shore* for some *Works*, wherein is required the *Air* and *Vapor* of the *Sea*. We have likewise *violent streams* and *Cataracts*, which serve us for many *Motions*, and likewise *Engins* for *multiplying* and *enforcing* of *Winds*, to set also on going divers *Motions*.

We

‘We have also a number of *Artificial Wells* and *Fountains*, made in imitation of the *Natural Sources* and *Baths*; as tinged upon *Vitriol*, *Sulphur*, *Steel*, *Brass*, *Lead*, *Nitre*, and other *Minerals*. And again we have little *Wells* for *Infusions* of many things, where the *Waters* take the virtue quicker and better then in *Vessels* or *Basins*: And amongst them we have a *Water* which we call *Water of Paradise*, being by that we do to it, made very sovereign for *Health* and *Prolongation of Life*.

‘We have also great and spacious *Houses*, where we imitate and demonstrate *Meteors*; as *Snow*, *Hail*, *Rain*, some *Artificial Rains* of *Bodies*, and not of *Water*, *Thunders*, *Lightnings*; also *Generations* of *Bodies* in *Air*, as *Frogs*, *Flies*, and divers others.

‘We have also certain *Chambers* which we call *Chambers of Health*, where we qualifie the *Air*, as we think good and proper for the cure of divers *Diseases*, and preservation of *Health*.

‘We have also fair and large *Baths* of several mixtures; for the cure of *Diseases*, and the restoring of *Mans Body* from *Arefaction*, and other, for the confirming of it in strength of *Sinews*, *Vital Parts*, and the very *Juice* and *Substance* of the *Body*.

‘We have also large and various *Orchards* and *Gardens*, wherein we do not so much respect *Beauty*, as variety of ground and soyl, proper for divers *Trees* and *Herbs*; and some very spacious, where *Trees* and *Berries* are set, whereof we make divers kinds of *Drinks*, besides the *Vineyards*. In these we practise likewise all conclusions of *Grafting* and *Inoculating*, as well of *Wild-Trees* as *Fruit trees*, which produceth many effects. And we make (by *Art*) in the same *Orchards* and *Gardens*, *Trees* and *Flowers* to come earlier or later then their *seasons*, and to come up and bear more speedily then by their *natural course* they do. We make them also (by *Art*) much greater, their *nature*, and their *Fruit* greater and sweeter, and of differing *taste*, *smell*, *colour* and *figure* from their *nature*; and many of them we so order, that they become of *Medicinal use*.

‘We have also means to make divers *Plants* rise, by mixtures of *Earths* without *Seeds*, and likewise to make divers new *Plants* differing from the *Vulgar*, and make one *Tree* or *Plant* turn into another.

‘We have also *Parks* and *Enclosures* of all sorts of *Beasts* and *Birds*; which we use not onely for view or rareness, but likewise for *Dissections* and *Tryals*, that thereby we may take light, what may be wrought upon the *Body* of *Man*, wherein we find many strange effects; as continuing *life* in them, though divers *parts*, which you account *vital* be perished and taken forth; *Resuscitating* of some that seem *dead* in appearance, and the like. We try also all *Poysons* and other *Medicines* upon them, as well of *Chirurgery* as *Physick*. By *Art* likewise we make them greater or taller then their *kind* is, and contrariwise dwarf them, and stay their *growth*: We make them more *fruitful* and *Bearing*, then their *Kind* is, and contrariwise *Barren* and not *Generative*. Also we make them differ in *Colour*, *Shape*, *Activity*, many ways. We find means to make commixtures and *Copulations* of divers *Kinds*, which have produced many new *Kinds*, and them not barren as the general opinion is. We make a number of *Kinds* of *Serpents*, *Worms*, *Flies*, *Fishes*, of *Putrefaction*; whereof some are advanced (in effect) to be perfect *Creatures*, like *Beasts* or *Birds*, and have *Sexes*, and do *propagate*. Neither do we this by chance, but we know beforehand of what matter and commixture what *Kind* of those *Creatures* will arise.

‘We

'We have also *Particular Pools* where we make *Tryals* upon *Fishes*,
'as we have said before of *Beasts* and *Birds*.

'We have also *Places* for *Breed* and *Generation* of those *Kinds* of
'*Worms* and *Flies* which are of *Special use*, such as are with you, your
'*Silk-Worms* and *Bees*.

'I will not hold you long with recounting of our *Brew-Houses*, *Bake-*
'*Houses*, and *Kitchens*, where are made divers *Drinks*, *Breads*, and *Meats*,
'rare and of special effects. *Wines* we have of *Grapes*, and *Drinks* of
'other *Juice*, of *Fruits*, of *Grains* and of *Roots*; and of *Mixtures* with
'*Honey*, *Sugar*, *Manna*, and *Fruits Dried*, and *Decocted*; also of the *Tears*
'or *Woundings* of *Trees*, and of the *Pulp* of *Canes*; and these *Drinks* are
'of several *Ages*, some to the *Age* or last of forty years. We have *Drinks*
'also brewed with several *Herbs*, and *Roots*, and *Spices*; yea, with several
'*Fleshes*, and *White-Meats*; whereof some of the *Drinks* are such, as they
'are in effect *Meat* and *Drink* both; so that divers, especially in *Age*, do
'desire to live with them, with little or no *Meat* or *Bread*. And above all we
'strive to have *Drinks* of *Extream thin parts*, to insinuate into the *Body*,
'and yet without all *Biting*, *Sharpness*, or *fretting*; insomuch, as some of
'them put upon the back of your *Hand*, will, with a little stay, pass through
'to the *Palm*, and yet taste *Milde* to the *Mouth*. We have also *Waters*
'which we *Ripen* in that fashion as they become *Nourishing*; so that they
'are indeed excellent *Drink*, and many will use no other. *Breads* we have
'of several *Grains*, *Roots* and *Kernels*, yea, and some of *Flesh* and *Fish*
'*Dried*, with divers *Kinds* of *Levenings* and *Seasonings*; so that some do
'extreamly move *Appetites*; some do nourish so, as divers to live of them
'without any other *Meat*, who live very long. So for *Meats*, we have some
'of them so *Beaten*, and made *Tender* and *Mortified*, yet without all *Cor-*
'*rupting*, as a weak *Heat* of the *Stomach* will turn them into good *Chylus*,
'as well as a *Strong Heat* would meat otherwise prepared. We have some
'*Meats* also, and *Breads*, and *Drinks*, which taken by men, enable them to
'*Fast* long after; and some other, that used, make the very *Flesh* of *Mens*
'*Bodies* sensibly more hard and tough, and their *Strength* far greater than
'otherwise it would be.

'We have *Dispensatories* or *Shops* of *Medicines*, wherein you may
'easily think, if we have such *Variety* of *Plants* and *Living Creatures*, more
'then you have in *Europe*, (for we know what you have) the *Simple Drugs*,
'and *Ingredients* of *Medicines*, must likewise be in so much the greater
'*Variety*. We have them likewise of diverse *Ages*, and long *Fermenta-*
'*tions*. And for their *Preparations*, we have not onely all Manner of ex-
'quisite *Distillations* and *Separations*, and especially by *Gentle Heats*, and
'*Percolations* through divers *Strainers*, yea and *Substances*; but also exact
'*Forms* of *Composition*, whereby thy incorporate almost as they were
'*Natural Simples*.

'We have also divers *Mechanical Arts*, which you have not, and
'*Stuffs* made by them; as *Papers*, *Linnen*, *Silks*, *Tissues*, dainty works of
'*Feathers* of wonderful lustre, excellent *Dies*, and many others; and *Shops*
'likewise as well for such as are not brought into *Vulgar use* amongst us,
'as for those that are. For you must know, that of the things before re-
'cited, many are grown into use throughout the *Kingdom*; but yet, if
'they did flow from our *Invention*, we have of them also for *Patterns* and
'*Principals*.

‘We have also *Furnaces* of great *Diversities*, and that keep great *Diversity* of *Heats*, *Fierce* and *Quick*, *strong* and *constant*, *Soft* and *Mild*, *Brown*, *Quiet*, *Dry*, *Moist*, and the like. But above all we have *Heats*, in imitation of the *Suns*, and *Heavenly Bodies Heats*, that pass divers *Inequalities*, and (as it were) *Orbs*, *Progresses* and *Returns*, whereby we may produce admirable effects. Besides we have *Heats* of *Dungs*, and of *Bellies* and *Maws* of *Living Creatures*, and of their *Bloods* and *Bodies*; and of *Hays* and *Herbs* laid up moist; of *Lime* unquenched, and such like. *Instruments* also which generate *Heat* onely by *Motion*; and further, *Places* for strong *Insulations*; and again, *Places* under the *Earth*, which by *Nature* or *Art* yield *Heat*. These divers *Heats* we use, as the *Nature* of the *Operation* which we intend, requireth.

‘We have also *Perspective Houses*, where we make *Demonstration* of all *Lights* and *Radiations*, and of all *Colours*; and out of *Things Uncoloured* and *Transparent*, we can represent unto you all several *Colours*, not in *Rainbows* (as it is in *Gems* and *Prisms*) but of themselves single. We represent also all *Multiplications* of *Light*, which we carry to great *Distance*, and make so *Sharp* as to discern small *Points* and *Lines*; also all *Colorations* of *Light*, all *Delusions* and *Deceits* of the *Sight*, in *Figures*, *Magnitudes*, *Motions*, *Colours*, all *Demonstrations* of *Shadows*. We finde also divers means, yet unknown to you, of *Producing* of *Light* originally from divers *Bodies*. We procure means of seeing *Objects* a far off, as in the *Heaven*, and *Remote Places*; and represent *Things* Near as a far off, and *Things* a far off as Near, making *Feigned Distances*. We have also *Helps* for the *Sight*, far above *Spectacles* and *Glasses* in use. We have also *Glasses* and *Means* to see *Small* and *Minute Bodies* perfectly and distinctly, as the *Shapes* and *Colours* of *Small Flies* and *Worms*, *Grains* and *Flaws* in *Gems*, which cannot otherwise be seen, *Observations* in *Vrine* and *Blood*, not otherwise to be seen. We make *Artificial Rainbows*, *Halo's*, and *Circles* about *Light*. We represent also all manner of *Reflexions*, *Refractions*, and *Multiplication* of *Visual Beams* of *Objects*.

‘We have also *Precious Stones* of all kindes, many of them of great beauty, and to you unknown; *Crystals* likewise, and *Glasses* of divers kindes, and amongst them some of *Metals* *Vitrified*, and other *Materials*, beside those of which you make *Glass*: also a number of *Fossiles* and *imperfect Minerals*, which you have not; likewise *Loadstones* of prodigious vertue, and other rare *Stones*, both *Natural* and *Artificial*.

‘We have also *Sound Houses*, where we practice and demonstrate all *Sounds* and their *Generation*. We have *Harmonies* which you have not, of *Quarter-Sounds*, and lesser *Slides* of *Sounds*; divers *Instruments* of *Musick* likewise to you unknown, some *Sweeter* then any you have, with *Bells* and *Rings* that are dainty and sweet. We represent *Small Sounds* as *Great* and *Deep*, likewise *Great Sounds* extenuate and *Sharp*. We make divers *Tremblings* and *Warblings* of *Sounds*, which in their *Original* are *Entire*. We represent and imitate all *Articulate Sounds* and *Letters*, and the *Voices* and *Notes* of *Beasts* and *Birds*. We have certain *Helps*, which set to the *Ear*, do further the *Hearing* greatly: We have also divers *Strange* and *Artificial Eccho's* *Reflecting* the *Voice* many times, and as it were *Tossing* it; and some that give back the *Voice Louder* then it came, some *Shriller* and some *Deeper*, yea, some rendring the *Voice Differing* in the *Letters* or *Articulate Sound* from that they receive. We have all means to convey *Sounds* in *Trunks* and *Pipes* in strange *Lines* and *Distances*.

We

'We have also *Perfume-Houses*, wherewith we joyn also *practises* of *Taste*; we *multiply Smells*, which may seem strange; we *imitate Smells*, making all *Smells* to breath out of other *mixtures* then those that give them; We make divers *imitations* of *Taste* likewise, so that they will deceive any *Mans Taste*. And in this House we contain also a *Confiture House*, where we make all *Sweet-meats*, dry and moist, and divers pleasant *Wines*, *Milk*, *Broths*, and *Sallets*, far in greater variety then you have.

'We have also *Engine-Houses*, where are prepared *Engines* and *Instruments* for all sorts of *Motions*. There we imitate and practise to make *swifter motions* then any you have, either out of your *Muskets* or any *Engine* that you have; and to make them, and multiply them more easily, and with *small force*, by *wheels* and other *means*; and to make them stronger and more violent then yours are, exceeding your greatest *Cannons*, and *Basilisks*. We represent also *Ordnance* and *Instruments of War*, and *Engines* of all kinds; and likewise new *mixtures* and *compositions* of *Gun-powder*, *Wildfires* burning in *Water* and *unquenchable*; also *Fire-works* of all variety, both for pleasure and use. We imitate also *flights of Birds*; we have some *degrees of flying* in the *Air*; we have *ships* and *Boats* for going under water, and brooking of *Seas*; also *swimming-girdles* and *Supporters*. We have divers curious *Clocks*, and other like *motions* of *Return*, and some *perpetual motions*. We imitate also *motions of Living creatures*, by *Images of Men*, *Beasts*, *Birds*, *Fishes*, and *Serpents*; we have also a great number of other various *Motions*, strange for quality, fineness, and subtilty.

'We have also a *Mathematical House*, where are represented all *Instruments*, as well of *Geometry*, as *Astronomy*, exquisitely made,

'We have also *Houses of Deceits* of the *Senses*, where we represent all manner of *feats of Jugling*, *false Apparitions*, *Impostures*, and *Illusions*, and their *Fallacies*. And surely, you will easily believe that we that have so many things truly *Natural*, which induce *admiration*, could in a world of particulars deceive the *Senses*, if we would disguise those things, and labor to make them more *miraculous*: But we do hate all *Impostures* and *Lies*; inso much, as we have severely forbidden it to all our *Fellows*, under pain of *Ignominy* and *Fines*, that they do not shew any *natural work* or thing, adorned or swelling, but onely pure as it is, and without all affectation of strangeness,

'These are (my Son) the riches of *Solomons House*.

'For the several employments and offices of our *Fellows*; we have twelve that sail into *Forreign Countreys* under the Names of other *Nations*, (for our own we conceal) who bring us the *Books*, and *Abstracts*, and *Partes* of *Experiments* of all other *Parts*. These we call *Merchants of Light*.

'We have three that Collect the *Experiments*, which are in all *Books*. These we call *Depredators*.

'We have three that collect the *Experiments*, of all *Mechanical Arts*, and also of *Liberal Sciences*, and also of *Practises* which are not brought into *Arts*. These we call *Mystery-men*.

'We have three that try new *Experiments*, such as themselves think good. These we call *Pioneers* or *Miners*.

'We have three that draw the *Experiments* of the former four into *Titles* and *Tables*, to give the better light for the drawing of *Observations* and *Axioms* out of them. These we call *Compilers*.

‘ We have three that bend themselves, *looking* into the *Experiments* of their *Fellows*, and cast about how to draw out of them *things of use* and *practice* for *Mans* life and *knowledge*, as well for *Works*, as for plain *Demonstration* of *Causes*, *means* of *Natural Divinations*, and the easie and clear *discovery* of the *Virtues* and *Parts* of *Bodies*. These we call *Dowry-men* or *Benefactors*.

‘ Then after divers *Meetings* and *Consults* of our whole *number*, to consider of the former *Labors* and *Collections*, we have three that take care out of them to *direct new Experiments* of a higher *Light*, more *penetrating* into *Nature* than the former. These we call *Lamps*.

‘ We have three others that do *execute* the *Experiment* so *directed*, and *report* them. These we call *Inoculators*.

‘ Lastly, We have three that raise the former *Discoveries* by *Experiments* into greater *Observations*, *Axioms*, and *Aphorisms*. These we call *Interpreters* of *Nature*.

‘ We have also, as you must think, *Novices* and *Apprentices*, that the succession of the former employed Men do not fail; besides a great number of *Servants* and *Attendants*, *Men* and *Women*. And this we do also, we have *Consultations* which of the *Inventions* and *Experiences* which we have discovered shall be published, and which not; and take all an *Oath* of *Secrecy* for the concealing of those which we think meet to keep secret; though some of those we do reveal sometime to the *State*, and some not.

‘ For our *Ordinances* and *Rites*; we have two very long and fair *Galleries*. In one of these we place *Patterns* and *Samples* of all manner of the more rare and excellent *Inventions*; in the other we place the *Statues* of all principal *Inventors*. There we have the *Statue* of your *Columbus*, that discovered the *West-Indies*, also the *Inventor* of *Ships*; your *Monk* that was the *Inventor* of *Ordnance*, and of *Gun-powder*; the *Inventor* of *Musick*; the *Inventor* of *Letters*; the *Inventor* of *Printing*; the *Inventor* of *Observations* of *Astronomy*; the *Inventor* of *Works* in *Metal*; the *Inventor* of *Glass*; the *Inventor* of *Silk* of the *Worm*; the *Inventor* of *Wine*; the *Inventor* of *Corn* and *Bread*; the *Inventor* of *Sugars*: And all these by more certain Tradition, than you have. Then we have divers *Inventors* of our own, of excellent *Works*, which since you have not seen, it were too long to make *Descriptions* of them; and besides in the right understanding of those *Descriptions* you might easily err. For upon every *Invention* of value we erect a *Statue* to the *Inventor*, and give him a liberal and honourable reward. These *Statues* are some of *Brass*, some of *Marble* and *Touch-stone*, some of *Cedar*, and other special *Woods* gilt and adorned, some of *Iron*, some of *Silver*, some of *Gold*.

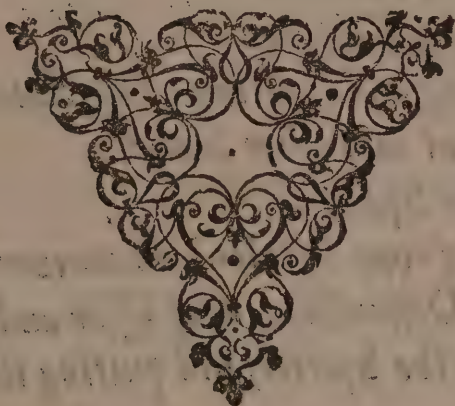
‘ We have certain *Hymns* and *Services* which we say daily, of *Laud* and *Thanks* to *God* for his *Marvellous Works*; and *Forms* of *Prayers* imploring his aid and blessing, for the *Illumination* of our *Labors*, and the turning them into good and *holy uses*.

‘ Lastly, We have *Circuits* and *Visits* of divers *Principal Cities* of the *Kingdom*, where, as it cometh to pass, we do publish such new *profitable Inventions*, as we think good. And we do also declare *Natural Divinations* of *Diseases*, *Plagues*, *swarms* of hurtful *Creatures*, *Scarcity*, *Tempest*, *Earth quakes*, great *inundations*, *Comets*, *Temperature* of the *Year*, and divers other things; and we give counsel thereupon, what the *People* shall do for the *prevention* and *remedy* of them.

‘ And

And when he had said this, he stood up: and I, as I had been taught, kneeled down, and he laid his right hand upon my head, and said, *God bleſs thee, my Son, and God bleſs this Relation which I have made: I give thee leave to publiſh it for the good of other Nations, for we here are in Gods Boſome, a Land unknown.* And ſo he left me, having aſſigned a value of about Two thouſand Ducats for a Bounty to me and my Fellows; for they give great largeſſes where they come upon all occaſions.

The Reſt was not Perfected.



Magnalia

Magnalia Naturæ præcipue quoad
usus Humanos.

THe *Prolongation of Life.*
Restitution of Youth in some degree.
Retarding of Age.
Curing of Diseases, counted Incurable.
Mitigation of Pain.

More Ease and less loathsome Purgings:

increasing of Strength and Activity.
increasing of ability, to suffer Torture or Pain.
The *altering of Complexions, and Fatness, and Leanness.*
altering of Statures
altering of Features.
increasing and exalting of the Intellectual Parts.

Version of Bodies into other Bodies.

Making of new Species.

Transplanting of one Species into another.

Instruments of Destruction, as of War and Poyson.

Exbilaration of the Spirits; and putting them in good disposition

Force of the Imagination, either upon another Body, or upon the Body itself.

Time in Maturations.
Time in Clarifications.
Acceleration of *Putrefaction.*
Decoction.
Germination.

Making rich Composts for the Earth.

Im-

Impressions of the Air, and raising of Tempests.

Great alteration, as Induration, Emollition, &c.

Turning Crude and Watry Substances into Oyly and Unctuous Substances.

Drawing of new Foods out of Substances not now in use.

Making new Threds for Apparel; and new Stuffs, such as are Paper, Glasse, &c.

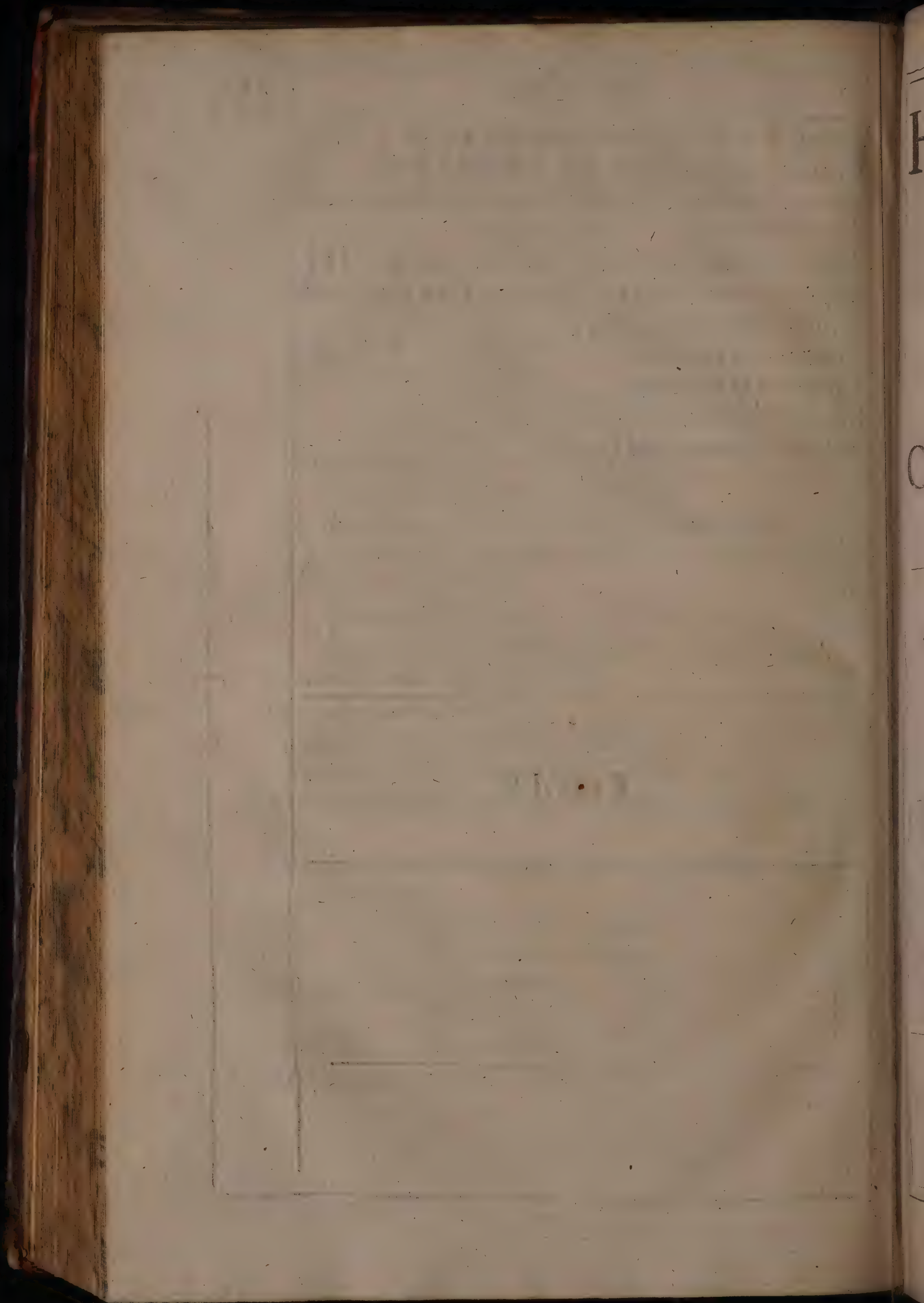
Natural Divinations.

Deceptions of the Senses.

Greater Pleasures of the Senses.

Artificial Minerals and Cements.

FINIS.



HISTORY

Natural and Experimental.

OF

LIFE & DEATH:

OR,

Of the Prolongation of Life.

Written in Latine by the Right Honourable

FRANCIS BACON,

BARON of *VERULAM*,

Viscount *St. Albans*.



LONDON,

Printed for *Thomas Lee* at the Turks head
in *Fleet-street*, 1676.

HISTORY

OF THE

REPUBLIC

OF THE

UNITED STATES

OF AMERICA



BY

JOHN



THE
HISTORY
OF
Life and Death.

The PREFACE.



It is an ancient saying and complaint, That *Life* is short, and *Art* long; wherefore it becometh us, who make it our chiefest aim to perfect *Arts*, to take upon us the consideration of *Prolonging Mans Life*, GOD, the *Author* of all *Truth* and *Life* prospering our Endeavors. For though the *Life* of *Man* be nothing else but a mass, and accumulation of Sins and sorrows, and they that look for an eternal Life set but light by a Temporary: Yet the continuation of Works of Charity ought not to be contemned, even by us *Christians*. Besides, the beloved *Disciple* of our Lord survived the other *Disciples*; and many of the Fathers of the Church; especially of the Holy Monks and Hermits, were long-lived: Which shews, that this blessing of long life, so often promised in the Old Law, had less abatement after our *Saviours* dayes, than other Earthly blessings had; but to esteem of this as the chiefest good, we are but too prone. Onely the enquiry is difficult how to attain the same; and so much the rather, because it is corrupted with false opinions and vain reports: For both those things, which the vulgar *Physitians* talk of, *Radical Moisture* and *Natural Heat*, are but meer Fictions; and the immoderate praises

praises of *Chymical Medicines*, first puff up with vain hopes, and then fail their admirers.

And as for that *Death* which is caused by Suffocation, Putrefaction, and several Diseases, we speak not of it now, for that pertains to an *History* of *Physick*; but onely of that *Leath* which comes by a total decay of the Body, and the Inconcoction of old Age. Nevertheless the last act of *Death*, and the very extinguishing of *Life* it self, which may so many ways be wrought outwardly and inwardly (which notwithstanding have, as it were, one common Porch before it comes to the point of death) will be pertinent to be inquired of in this Treatise; but we reserve that for the last place.

That which may be repaired by degrees, without a total waste of the first stock, is potentially eternal, as the *Vestal Fire*. Therefore when *Physicians* and *Philosophers* saw that living Creatures were nourished and their Bodies repaired, but that this did last onely for a time, and afterwards came Old age, and in the end Dissolution; they sought death in somewhat which could not properly be repaired, supposing a *Radical Moisture* incapable of solid reparation, and which, from the first infancy, received a spurious addition, but no true reparation, whereby it grew daily worse and worse, and, in the end, brought the bad to none at all. This conceit of theirs was both ignorant and vain; for all things in living Creatures are in their youth repaired entirely; nay, they are for a time increased in quantity, bettered in quality, so as the Matter of reparation might be eternal, if the manner of reparation did not fail. But this is the truth of it, There is in the declining of age an unequal reparation; some parts are repaired easily, others with difficulty and to their loss; so as from that time the Bodies of Men begin to endure the torments of *Mentis*, That the Living die in the embraces of the dead; and the parts easily repairable, through their conjunction with the parts hardly repairable, do decay: For the *Spirits*, *Blood*, *Flesh*, and *Fat* are, even after the decline of years, easily repaired; but the drier and more porous parts (as the *Membranes*; all the *Tunics*, the *Sinews*, *Arteries*, *Veins*, *Bones*, *Cartilages*, most of the *Bowels*, in a word almost all the *Orgonical Parts*) are hardly repairable, and to their loss. Now these hardly repairable parts, when they come to their office of repairing the other, which are easily repairable, finding themselves deprived of their wanted ability and strength, cease to perform any longer their proper Functions: By which means it comes to pass that in process of time the whole tends to dissolution; and even those very parts, which in their own nature are with much ease repairable, yet through the decay of the Organs of reparation can no more receive reparation, but decline, and in the end utterly fail. And the cause of the termination of *Life* is this, for that the *Spirits*, like a gentle flame, continually preying upon Bodies, conspiring with the outward *Air*, which is ever sucking and drying of them, do, in time, destroy the whole Fabrick of the Body, as also the particular Engines and Organs thereof and make them unable for the work of Reparation. These are the true ways of *Natural Death*, well and faithfully to be revolved in our minds; for he that knows not the way of *Nature*, how can he succour her, or turn her about.

Therefore the *Inquisition* ought to be twofold; the one touching the *Consumption* or *Depredation* of the Body of Man, the other touching the *Reparation* and *Renovation* of the same: To the end, that the former may.



TO THE
R E A D E R.



Am to give Advertifement, that there came forth of late a *Translation* of this *Book* by an unknown *Person*, who though he wished well to the propagating of his *Lordships Works*, yet he was altogether unacquainted with his *Lordships* ftile, and manner of *Expressions*, and fo published a *Translation* lame and defective in the whole. VVhereupon I thought fit to recommend the same to be tranſlated a new by a more diligent and zealous Pen, which hath ſince travelled in it; and though it ſtill comes ſhort of that lively and incomparable Spirit and expreſſion, which lived and died with the *Author*, yet I dare avouch it to be much more warrantable and agreeable than the former. It is true, this *Book* was not intended to have been published in *Engliſh*; but ſeeing it hath been already made free of that *Language*, whatſoever benefit or delight may redound from it, I commend the ſame to the *Courteous* and *Judicious Reader*.

W. R.

Bb 2 To



To the present Age and Posterity,
Greeting.



Although I had ranked the History of Life and Death as the last amongst my Six Monethly Designations; yet I have thought fit, in respect of the prime use thereof, (in which the least loss of time ought to be esteemed precious) to invert that order, and to send it forth in the second place. For I have hope, and wish, that it may conduce to a common good; and that the Nobler sort of Physicians will advance their thoughts, and not imploy their times wholly in the sordidness of Cures, neither be honoured for Necessity onely, but that they will become Coadjutors and Instruments of the Divine Omnipotence and Clemency in Prolonging and Renewing the Life of Man; especially seeing I prescribe it to be done, by safe, and convenient, and civil wayes, though hitherto unassayed. For though we Christians do continually aspire and pant after the Land of Promise; yet it will be a token of Gods favour towards us in our journeyings through this Worlds Wilderness, to have our Shoes and Garments (I mean those of our frail Bodies) little worn or impaired.

FR. ST. ALBANS.

THE

as much as is possible, be forbidden and restrained, and the latter comfort-
ed. The former of these pertains, especially to the *Spirits* and outward
Air, by which the Depredation and Waste is committed; the latter to the
whole race of *Alimentation* or *Nourishment*, whereby the Renovation or
Restitution is made. And as for the former part touching *Consumption*,
this hath many things common with *Bodies Inanimate*, or without Life. For
such things as the *Native Spirit* (which is in all tangible bodies, whether
living or without life) and the Ambient or external Air worketh upon
Bodies Inanimate, the same it attempteth upon *Animate* or *Living Bodies*;
although the *Vital Spirit* superadded, doth partly break and bridle those
operations, partly exalt, and advance them wonderfully. For it is most
manifest that *inanimate Bodies* (most of them will indure a long time with-
out any Reparation; but *Bodies Animate* without Food and Reparation
suddenly fall and are extinguished, as the Fire is. So then, our *Inquisition*
shall be double. First, we will consider the Body of man as *Inanimate*, and
not repaired by *Nourishment* : Secondly, as *Animate* and repaired by *Nour-*
ishment. Thus having Prefaced these things, we come now to the *Topick*
places of *Inquisition*.

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THE
Particular Topick Places:
OR,
ARTICLES of INQUISITION
TOUCHING
LIFE and DEATH.



First, Inquire of *Nature Durable*, and *Not Durable*, in Bodies Inanimate, or without Life, as also in Vegetables; but that not in a large or just Treatise, but as in a Brief or Summary only.

Also inquire diligently of *Desiccation*, *Arefaction*, and *Consumption* of Bodies Inanimate, and of Vegetables, and of the ways and Processes by which they are done: And further, of inhibiting and delaying of *Desiccation*, *Arefaction*, and *Consumption*, and of the *Conservation* of Bodies, in their proper state: And again, of the *Inteneration*, *Egrolition*, and *Recovery* of Bodies to their former freshness, after they be once dried and withered.

Neither need the *Inquisition*, touching these things, to be full or exact, seeing they pertain rather to their proper Title of *Nature durable*; seeing also, they are not Principals in this *Inquisition*, but serve only to give light to the *Prolongation* and *Instauration* of Life in Living Creatures. In which (as was said before) the same things come to pass, but in a particular manner. So from the *Inquisition* touching Bodies Inanimate and Vegetables, let the *Inquisition* pass on to other Living Creatures besides Man.

Inquire touching the length and shortness of Life in Living Creatures, with the due circumstances which make most for their long or short lives.

But because the *Duration* of Bodies is twofold, one in *Identity*, or the self-same substance, the other by a *Renovation*, or *Reparation*; whereof the former hath place only in Bodies Inanimate, the latter in Vegetables, and living Creatures, and is perfected by *Alimentation*, or *Nourishment*: therefore it will be fit to inquire of *Alimentation*, and of the ways and progresses thereof; yet this not exactly, (because it pertains properly to the Titles of *Assimilation* and *Alimentation*) but, as the rest, in progress only.

From the *Inquisition* touching Living Creatures, and Bodies repaired by *Nourishment*, pass on to the *Inquisition* touching Man. And now being come to the principal subject of *Inquisition*, the *Inquisition* ought to be in all points more precise and accurate.

Inquire touching the length and shortness of Life in Men, according to the Ages of the World, the several Regions, Climates, and places of their Nativity and Habitation.

Inquire touching the length and shortness of life in Men, according to their Races and Families, as if it were a thing hereditary; also according to their Complexions, Constitutions, and Habits of Body, their Statures, the manner and time of their growth, and the making and composition of their Members.

Inquire touching the length and shortness of life in Men, according to the times of their Nativity; but so, as you omit for the the present all *Astrological* observations, and the Figures of Heaven, under which they were born, only insist upon the vulgar and

manifest Observations; as whether they were born in the Seventh, Eighth, Ninth, or Tenth Month; also, whether by Night or by Day, and in what Month of the Year.

8. Inquire touching the *length and shortness of life in Men*, according to their *Fare, Diet, Government of their Life, Exercises*, and the like. For as for the *Air* in which men live and make their abode, we account that proper to be inquired of in the above-said *Article*, touching the places of their Habitation.

9. Inquire touching the *length and shortness of life in Men*, according to their *Studies*, their several *Courses of Life*, the *Affections of the Mind*, and divers *Accidents* befalling them.

10. Inquire apart touching those *Medicines* which are thought to prolong *Life*.

11. Inquire touching the *Signs and Prognosticks of long and short life*; not those which betoken *Death* at hand, (for they belong to an *History of Physick*) but those which are seen, and may be observed even in *Health*, whether they be *Physiognomical Signs*, or any other.

Hitherto have been propounded *Inquisitions* touching *length and shortness of Life*, besides the *Rules of Art*, and in a confused manner; now we think to add some, which shall be more *Art-like*, and tending to practice, under the name of *Intentions*. Those *Intentions* are generally three: As for the particular *Distributions* of them, we will propound them when we come to the *Inquisition* it self. The three general *Intentions* are, the *Forbidding of Waste and Consumption*, the *Perfecting of Reparation*, and the *Renewing of Oldness*.

12. Inquire touching those things which conserve and exempt the *Body of Man* from *Arefaction and Consumption*, at least which put off and protract the inclination thereunto.

13. Inquire touching those things which pertain to the whole process of *Alimentation*, (by which the *Body of Man* is repaired) that it may be good, and with the best improvement.

14. Inquire touching those things which purge out the *Old Matter*, and supply with new; as also which do intenerate and moisten those parts which are already dried and hardened.

But because it will be hard to know the ways of *Death*, unless we search out and discover the *Seat*, or *House*, or rather *Den of Death*, it will be convenient to make *Inquisition* of this thing; yet not of every kind of *Death*, but of those *Deaths* which are caused by want and indigence of *Nourishment*, not by violence; for they are those *Deaths* only which pertain to a decay of *Nature*, and meer *old Age*.

15. Inquire touching the *Point of Death*, and the *Porches of Death* leading thereunto from all parts, so as that *Death* be caused by a decay of *Nature*, and not by violence.

16. Lastly, Because it is behoveful to know the *Character and Form of Old Age*, which will then best be done, if you make a *Collection* of all the *Differences*, both in the *State* and *Functions* of the *Body*, betwixt *Youth* and *Old Age*, that by them you may observe what it is that produceth such manifold *Effects*; let not this *Inquisition* be omitted.

17. Inquire diligently touching the *Differences* in the *State* of the *Body*, and *Faculties of the Mind* in *Youth* and *Old Age*; and whether there be any that remain the same without alteration or abatement in *Old Age*.

Nature Durable, and not Durable.

The History.

To the first
Article.

Metals are of that long lasting, that Men cannot trace the beginnings of them; and when they do decay, they decay through *Rust*, not through perspiration into *Air*; yet *Gold* decays neither way.

1. *Quick-silver*, though it be an humid and fluid *Body*, and easily made volatile by *Fire*, yet (as far as we have observed) by *Age* alone, without *Fire*, it neither wasteth nor gathereth *Rust*.

2. *Stones*, especially the harder sort of them, and many other *Fossiles*, are of long last-

ing,

ing, and that though they be exposed to the open air; much more if they be buried in the earth. Notwithstanding *Stones* gather a kind of *Nitre*, which is to them instead of *Rust*. *Precious Stones* and *Chrystals* exceed *Metals* in long lasting; but then they grow dimmer and less *Orient*, if they be very old.

It is observed, that *Stones* lying towards the North do sooner decay with age than those that lie toward the South; and that appears manifestly in *Pyramids*, and *Churches*, and other ancient *Buildings*: contrariwise, in *Iron*, that exposed to the South, gathers *Rust* sooner, and that to the North later; as may be seen in the *Iron bars* of windows. And no marvel, seeing in all putrefaction (as *Rust* is) Moisture hastens Dissolutions; in all simple Arefaction, Driness.

In *Vegetables*, (we speak of such as are fell'd, not growing) the *Stocks* or *Bodies* of harder *Trees*, and the *Timber* made of them, last divers ages. But then there is difference in the bodies of *Trees*: some *Trees* are in a manner spongy, as the *Elder*, in which the pith in the midst is soft, and the outward part harder; but in *Timber-trees*, as the *Oaks*, the inner part (which they call *Heart of Oak*) lasteth longer.

The *Leaves*, and *Flowers*, and *Stalks* of *Plants* are but of short lasting, but dissolve into dust, unless they putrefie: the *Roots* are more durable.

The *Bones* of living *Creatures* last long, as we may see it of mens bones in *Charnel-houses*: *Horns* also last very long; so do *Teeth*, as it is seen in *Ivory*, and the *Sea-horse Teeth*.

Hides also and *Skins* endure very long, as is evident in old *Parchment-books*: *Paper* likewise will last many ages, though not so long as *Parchment*.

Such things as have passed the *Fire* last long, as *Glass* and *Brick*; likewise *Flesh* and *Fruits* that have passed the *Fire* last longer than *Raw*, and that not onely because the *Baking* of the *Fire* forbids putrefaction; but also because the watry humour being drawn forth, the oily humour supports it self the longest.

Water of all *Liquors* is soonest drunk up by *Air*, contrariwise *Oil* latest; which we may see not onely in the *Liquors* themselves, but in the *Liquors* mixt with other *Bodies*: for *Paper* wet with water, and so getting some degree of transparency, will soon after wax white, and lose the transparency, again the watry vapour exhaling; but oiled *Paper* will keep the transparency long, the *Oil* not being apt to exhale: And therefore they that counterfeit mens hands, will lay the oiled paper upon the writing they mean to counterfeit, and then assay to draw the lines.

Gums all of them last very long; the like do *Wax* and *Honey*.

But the equal or unequal use of things conduceth no less to long lasting or short lasting, than the things themselves; for *Timber*, and *Stones*, and other *Bodies*, standing continually in the *water*, or continually in the *air*, last longer than if they were sometimes wet, sometimes dry: and so *Stones* continue longer, if they be laid towards the same coast of *Heaven* in the *Building* that they lay in the *Mine*. The same is of *Plants* removed, if they be coasted just as they were before.

Observations.

Let this be laid for a Foundation, which is most sure, That there is in every *Tangible* body a *Spirit*, or body *Pneumatical*, enclosed and covered with the *Tangible* parts; And that from this *Spirit* is the beginning of all *Dissolution* and *Consumption*, so as the *Antidote* against them is the detaining of this *Spirit*.

This *Spirit* is detained two ways: either by a strait Inclosure, as it were in a *Prison*: or by a kind of free and voluntary Detention. Again, this voluntary stay is perswaded two ways: either if the *Spirit* it self be not too moveable or eager to depart, or if the external *Air* importune it not too much to come forth. So then, two sorts of *Substances* are durable, *Hard Substances*, and *Oily*: *Hard Substance* binds in the *Spirits* close; *Oily* partly enticeth the *Spirit* to stay, partly is of that nature that it is not importuned by *Air*; for *Air* is consubstantial to *Water* and *Flame* to *Oil*. And touching *Nature* *Durable* and not *Durable* in *Bodies* *Inanimate*, thus much.

The History.

Herbs of the colder sort die yearly both in *Root* and *Stalk*; as *Lettice*, *Purslane*; also *Wheat* and all kind of *Corn*: yet there are some cold *Herbs* which will last

three or four years; as the *Violet*, *Straw-berry*, *Burnet*, *Prim-rose*, and *Sorrel*. But *Borage* and *Bugloss*, which seem so alike when they are alive, differ in their deaths; for *Borage* will last but one year, *Bugloss* will last more.

14. But many hot Herbs bear their age and years better; *Hyssop*, *Thyme*, *Savory*, *Pot-marjoram*, *Balm*, *Wormwood*, *Germander*, *Sage*, and the like. *Fennel* dies yearly in the stalk buds again from the root: but *Pulse* and *Sweet-marjoram* can better endure age than winter; for being set in a very warm place and well-fenced, they will live more than one year. It is known that a knot of *Hyssop* twice a year shorn hath continued forty years.

15. *Bushes* and *Shrubs* live threescore years, and some double as much. A *Vine* may attain to threescore years, and continue fruitful in the old age. *Rose-mary* well placed will come also to threescore years; but *white Thorn* and *Ivy* endure above an hundred years. As for the *Bramble*, the age thereof is not certainly known, because bowing the head to the ground it gets new roots, so as you cannot distinguish the old from the new.

16. Amongst great *Trees* the longest livers are the *Oak*, the *Holm*, *Wild ash*, the *Elm*, the *Beech tree*, the *Chest-nut*, the *Plane tree*, *Ficus Ruminatis*, the *Lote-tree*, the *Wild-Olive*, the *Palm tree*, and the *Mulberry tree*. Of these, some have come to the age of eight hundred years; but the least livers of them do attain to two hundred.

17. But *Trees* *Odorate*, or that have sweet woods, and *Trees* *Roxenny*, last longer in their Woods or Timber than those above-said, but they are not so long liv'd; as the *Cypresse-tree*, *Maple*, *Pine*, *Box*, *Juniper*. The *Cedar* being born out by the vastness of his body, lives well-near as long as the former.

18. The *Ash*, fertile and forward in bearing, reacheth to an hundred years and somewhat better; which also the *Birch*, *Maple*, and *Sirvice-tree*, sometimes do: but the *Poplar*, *Lime tree*, *Willow*, and that which they call the *Sycamore*, and *Walnut tree*, live not so long.

19. The *Apple-tree*, *Pear-tree*, *Plum-tree*, *Pomegranate-tree*, *Citron-tree*, *Medlar-tree*, *Black-Cherry-tree*, *Cherry-tree*, may attain to fifty or sixty years; especially if they be cleansed from the Moss wherewith some of them are clothed.

20. Generally, greatness of body in trees, if other things be equal, hath some congruity with length of life; so hath hardness of substance: and trees bearing Mast or Nuts, are commonly longer livers than trees bearing Fruit or Berries: likewise trees putting forth their leaves late, and shedding them late again, live longer than those that are early either in leaves or fruit: the like is of *Wild-trees* in comparison of *Orchard trees*. And lastly, in the same kind, trees that bear a sower fruit out live those that bear a sweeter fruit.

An Observation.

Aristotle noted well the difference between Plants and living Creatures, in respect of their Nourishment and Reparation: Namely, that the bodies of living Creatures are confined within certain bounds, and that after they be come to their full growth, they are continued and preserved by Nourishment, but they put forth nothing new except Hair and Nails, which are counted for no better than Excrements; so as the juice of living creatures must of necessity sooner wax old: but in Trees, which put forth yearly new boughs, new shoots, new leaves, and new fruits, it comes to pass that all these parts in Trees are once a year young and renewed. Now it being so, that whatsoever is fresh and young draws the Nourishment more lively and cheerfully to it than that which is decayed and old, it happens withall, that the stock and body of the tree, through which the sap passeth to the branches, is refreshed and cheated with a more bountiful and vigorous nourishment in the passage than otherwise it would have been. And this appears manifest (though Aristotle noted it not, neither hath he expressed these things so clearly and perspicuously) in Hedges, Coppes, and Pollards, when the plathing, shedding, or lopping comfirteth the old stem or stock, and maketh it more flourishing and longer liv'd.

Desiccation.

Desiccation, Prohibiting of Desiccation, and In-teneration of that which is desiccated and dried.

The History.

Fire and strong Heats dry some things, and melt others.

Limus ut hic durefcit, & hac ut Cera liquefcit, Uno eodemque Igne?
How this Clay is hardened, and how this wax is melted, with one and the same thing, Fire? It drieth Earth, Stones, Wood, Cloth, and Skins, and whatsoever is not liquefiable; and it melteth Metals, Wax, Gums, Butter, Tallow, and the like.

Notwithstanding, even in those things which the fire melteth, if it be very vehement and continueth, it doth at last dry them. For metal in a strong fire, (Gold onely excepted) the volatile part being gone forth, will become less ponderous and more brittle; and those oily and fat substances in the like fire will burn up, and be dried and parched.

Air, especially open Air, doth manifestly dry, but not melt: as High wayes, and the upper part of the Earth, moistned with showers, are dried, linnen clothes washed, if they be hang'd out in the Air, are likewise dried; herbs, and leaves, and flowers, laid forth in the shade, are dried. But much more suddenly doth the Air this, if it be either enlightened with the Sun beams, (so that they cause no putrefaction) or if the air be stirred, as when the wind bloweth, or in rooms open on all sides.

Age most of all, but yet slowest of all, drieth; as in all bodies, which (if they be not prevented by putrefaction) are drie with Age. But age is nothing of it felt, being onely the measure of time; that which causeth the effect is the native Spirit of bodies, which sucketh up the moisture of the body, and then, together with it, flieth forth and the air ambient, which multiplieth it self upon the native spirits and juices of the body, and preyeth upon them.

Cold of all things most properly drieth: for drying is not caused but by contraction; now contraction is the proper work of cold. But because we Men have heat in a high degree, namely, that of Fire, but cold in a very low degree, no other than that of Winter, or perhaps of Ice, or of Snow, or of Nitre; therefore the drying caused by cold is but weak, and easily resolved. Notwithstanding we see the surface of the earth to be more dried by Frost or by March-winds, than by the Sun, seeing the same wind both licketh up the moisture, and affecteth with coldness.

Smok is a drier; as in Bacon and Neats-tongues, which are hanged up in the chimneys: and perfumes of Olibanum or Lignum Aloes and the like, dry the Brain and cure Catarrhs.

Salt, after some reasonable continuance, drieth, not onely on the out side, but in the inside also; as in Flesh and Fish salted, which, if they have continued any long time, have a manifest hardness within.

Hot Gums applied to the skin, dry and wrinkle it; and some astringent waters also do the same.

Spirit of strong waters imitateth the fire in drying: for it will both potch an Egg put into it, and toast Bread.

Powders dry like Sponges by drinking up the moisture, as it is in Sand thrown upon Lines new written: also smoothness and politeness of bodies (which suffer not the vapour of moisture to go in by the pores) dry by accident, because it exposeth it to the Air; as it is seen in precious Stones, Looking-glasses, and Blades of Swords, upon which if you breath, you shall see at first a little mist, but soon after it vanisheth like a cloud. And thus much for Desiccation or Drying.

They use at this day in the East parts of Germany, Garners in Vaults under ground, wherein they keep Wheat and other grains, laying a good quantity of straw both under the graines and about them, to save them from the dampness of the Vault by which device they keep their grains 20 or 30 years. And this doth not onely preserve them from rustiness, but (that which pertains more to the present inquisition) preserves them also in that greenness that they are fit and serviceable to make bread. The same is reported to have been in use in Capadocia and Thracia, and some parts of Spain.

The placing of Garners on the tops of houses, with windows towards the East and North, is very commodious. Some also make two Sollars, an upper and a lower; and the upper Sollar hath an hole in it, through which the grain continually descendeth, like sand in an hour-glass, and after a few dayes they throw it up again with shovels, that so it may be in continual motion. Now it is to be noted

To the second Article.

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that this doth not only prevent the Fustiness, but conserveth the Greeness and slacketh the Desiccation of it. The cause is that which we noted before, That the discharging of the *Watry humour*, which is quickned by the *Motion* and the *Winds*, preserves the *Oily humour* in his being, which otherwise would fly out together with the *Watry humour*. Also in some Mountains, where the *Air* is very pure, dead *Carkases* may be kept for a good while without any great decay.

13. Fruits as *Pomegranates*, *Citrons*, *Apples*, *Pears*, and the like; also *Flowers*, as *Roses* and *Lilies*, may be kept a long time in Earthen Vessels close stopped: howsoever, they are not free from the injuries of the outward *Air*, which will affect them with his unequal Temper through the sides of the Vessel, as it is manifest in heat and cold. Therefore it will be good to stop the mouths the Vessels carefully, and to bury them within the *Earth*; and it will be as good not to bury them in the *Earth*, but to sink them in the *Water*, so as the place be shady, as in *Wells* or *Cisterns* placed within doors: but those that be sunk in *Water* will do better in Glass vessels than in Earthen.

14. Generally those things which are kept in the *Earth*, or in *Vaults* under ground, or in the bottom of a *Well*, will preserve their freshness longer than those things that are kept above ground.

15. They say it hath been observed, that in *Conservatories* of *Snow* (whether they were in Mountains, in natural Pits, or in Wells made by Art for that purpose) an *Apple*, or *Chest-nut*, or *Nut*, by chance falling in, after many moneths, when the *Snow* hath melted, hath been found in the *Snow* as fresh and fair as if it had been gathered the day before.

16. Country people keep *Clusters* of *Grapes* in *Meal*, which though it makes them less pleasant to the taste, yet it preserves their moisture and freshness. Also the harder sort of *Fruits* may be kept long, not only in *Meal*, but also in *Saw-dust*, and in *heaps* of *Corn*.

17. There is an opinion held, *Bodies* may be preserved fresh in *Liquors* of their own kind, as in their proper *Menstrua*; as, to keep *Grapes* in *Wine*, *Olives* in *Oil*.

18. *Pomegranates* and *Quinces* are kept long, being lightly dipped in *Sea-water* or *Salt water*, and some after taken out again, and then dried in the open *Air*, so it be in the *Shade*.

19. *Bodies* put in *Wine*, *Oil*, or the *Lees* of *Oil*, keep long; much more in *Honey* or *Spirit* of *Wine*; but most of all, as some say, in *Quick-silver*.

20. *Fruits* inclosed in *Wax*, *Pitch*, *Plaster*, *Paste* or any the like Case or Covering, keep green very long.

21. It is manifest that *Flies*, *Spiders*, *Ants* or the like small creatures, falling by chance into *Amber*, or the *Gums* of *Trees* and so finding a burial in them, do never after corrupt or rot, although they be soft and tender *Bodies*.

22. *Grapes* are kept long by being hanged up in *Bunches*: the same is of other *Fruits*. For there is a two-fold Commodity of this thing; the one, that they are kept without pressing or bruising, which they must needs suffer, if they were laid upon any hard substance; the other, that the *Air* doth encompass them on every side alike.

23. It is observed that *Putrefaction*, no less than *Desiccation* in *Vegetables*, doth not begin in every part alike, but chiefly in that part where, being alive, it did attract nourishment. Therefore some advise to cover the stalks of *Apples* or other *Fruits* with *Wax* or *Pitch*.

24. Great *Wicks* of *Candles* or *Lamps* do sooner consume the *Tallow* or *Oil* than lesser *Wicks*; also *Wicks* of *Cotten* sooner than those of *Rush*, or *Straw*, or small *Twigs*: and in *Staves* of *Torches*, those of *Juniper* or *Firre* sooner than those of *Ash*: likewise *Flame* moved and fanned with the *Wind* sooner than that which is still: And therefore *Candles* set in a *Laniborn* will last longer than in the open *Air*. There is a Tradition, that *Lamps* set in *Sepulchres* will last an incredible time.

25. The Nature also and Preparation of the Nourishment conduceth no less to the lasting of *Lamps* and *Candles*, than the nature of the *Flame*; for *Wax* will last longer than *Tallow*, and *Tallow* a little wet longer than *Tallow* dry; and *Wax-candles* old made, longer than *Wax-candles* new made.

26. *Trees*, if you stir the *Earth* about their *Root* every year, will continue less time; if once in four, or perhaps in ten years, much longer: also cutting off the *Sackers* and young shoots will make them live the longer: but *Dunging* them, or laying of *Marl* about their *Roots*, or much *Warring* them, adds to their fertility, but cuts off from their long lasting. And thus much touching the Prohibiting of *Desiccation* or *Consumption*.

The Inteneration or making tender of that which is dried (which is the chief matter) affords but a small number of Experiments. And therefore some few Experiments which are found in living Creatures, and also in Man, shall be joyned together.

Bands of Willow, wherewith they use to bind Trees, laid in water, grow more flexible: Likewise they put Boughs of Birch (the ends of them) in Earthen Pots filled with Water, to keep them from withering; and Bowls cleft with driness, steep'd in water, close again.

Boots grown hard and obstinate with age, by greasing them before the Fire with Tallow wax soft, or being only held before the Fire, get some softness. *Bladders* and *Parchments* hardened also, become tender with warm water, mixed with Tallow, or any fat thing; but much the better, if they be a little chafed.

Trees grown very old, that have stood long without any culture, by digging and opening the Earth about the Roots of them, seem to grow young again, and put forth young Branches.

Old Draught-Oxen worn out with labour, being taken from the yolk, and put into fresh Pasture, will get young and tender flesh again: infomuch, that they will eat as fresh and tender as a *Steer*.

A strict Emaciating Diet of *Guaiacum*, *Bisket*, and the like, (wherewith they use to cure the *French-Pox*, *Old Catarrhs*, and some kind of *Dropsies*) doth first bring men to great poverty and leanness, by wasting the Juices and Humours of the Body; which after they begin to be repaired again, seem manifestly more vigorous and young. Nay, and I am of opinion, that Emaciating Diseases afterwards well cured, have advanced many in the way of long life.

Observations.

MEN see clearly, like Owls, in the Night of their own Notions; but in Experience, as in the Day-light, they wink, and are but half sighted. They speak much of the Elementary quality of Siccity or Driness, and of things Desiccating, and of the Natural Periods of Bodies in which they are corrupted and consumed: But mean while, either in the beginnings, or middle passages, or last acts of Desiccation and Consumption, they observe nothing that is of moment.

Desiccation or Consumption, in the process thereof, is finished by three Actions; and all these (as was said before) have their Original from the Native Spirit of Bodies.

The first Action is, the Attenuation of the Moisture into Spirit: the second is, the issuing forth, or flight of the Spirit; the third is, the Contraction of the grosser parts of the Body immediately after the Spirit issued forth. And this last is, that Desiccation and Induration, which we chiefly handle. The former two consume only.

Touching Attenuation, the matter is manifest: For the Spirit which is inclosed in every Tangible Body forgets not its nature, but whatsoever it meets withal in the Body (in which it is inclosed) that it can digest and master, and turn into it self, that it plainly alters and subdues, and multiplies it self upon it, and begets new Spirit. And this evicted by one proof, instead of many; for that those things which are thoroughly dried are lessened in their weight, and become hollow, porous, and resounding from within. Now it is most certain, that the inward Spirit of any thing, confers nothing to the weight, but rather lightens it; and therefore it must needs be, that the same Spirit hath turned into it the moisture and juyce of the Body which weighed before, by which means the weight is lessened. And this is the first Action, the Attenuation of the Moisture, and converting it into Spirit.

The second Action, which is the issuing forth, or Flight of the Spirit, is as manifest also. For that issuing forth, when it is in throngs, is apparent even to the sense, in Vapours to the sight, in Odours to the smelling; but if it issueth forth slowly, (as when a thing is decayed by age) then it is not apparent to the sense, but the matter is the same. Again, where composure of the Body is either so streight, or so tenacious, that the Spirit can find no pores or passages by which to depart, then, in the striving to get out, it drives before it the grosser parts of the Body, and protrudes them beyond the superficies or surface of the Body; as it is in the rust of Metals, and mould of all fat things. And this is the second Action, the issuing forth, or Flight of the Spirit.

The third Action is somewhat more obscure, but full as certain; that is, the Contraction of the grosser parts after the Spirit issued forth. And this appears, first, in that Bodies after the Spirit issued forth, do manifestly shrink, and fill a less room; as it is in the

the Kernels of Nuts, which after they are dried, are too little for the Shells; and in Beams and Planchers of Houses, which at first lay close together, but after they are dried give; and likewise in Bowls, which through drought grow full of Crannies, the parts of the Bowl contracting themselves together, and after contraction must needs be empty spaces. Secondly, It appears by the wrinkles of Bodies dried, for the endeavour of contracting it self is such, that by the contraction it brings the parts nearer together, and so lifts them up; for what soever is contracted on the sides, is lifted up in the midst: And this is to be seen in Papers and old Parchments, and in the skins of living Creatures, and in the Coats of soft Cheeses: all which, with age, gather wrinkles. Thirdly, This Contraction shews it self most in those things, which by heat are not only wrinkled, but ruffled and plighted, and, as it were, rould together; as it is in Papers, and Parchments, and Leaves, brought near the Fire: For Contraction by Age, which is more slow, commonly causeth wrinkles; but Contraction by the Fire, which is more speedy, causeth plighting. Now in most things where it comes not to wrinkling or plighting, there is simple Contraction, and angustiation or streightning, and induration or hardning, and desiccation, as was shewed in the first place. But if the issuing forth of the Spirit, and absorption or waste of the Moisture be so great, that there is not left body sufficient to unite and contract it self, then of necessity Contraction must cease, and the body become putrid, and nothing else but a little dust cleaving together, which with a light touch is dispersed, and falleth asunder; as it is in Bodies that are rotten, and in Paper burnt, and Linnen made into Tinder, and Carcasses embalmed after many Ages. And this is the third Action, the Contraction of the grosser parts after the Spirit issueth forth.

7. It is to be noted, that Fire and Heat dry only by accident; for their proper work is to attenuate and dilate the Spirit and Moisture; and then it follows by accident, that the other parts should contract themselves, either for the flying of Vacuum alone, or for some other motion without, whereof we now speak not.

8. It is certain, that Putrefaction taketh its Original from the Native Spirit, no less than Arefaction; but it goeth on a far different way: For in Putrefaction, the Spirit is not simply vapoured forth, but being detained in part, works strange garboils; and the grosser parts are not so much locally contracted, as they congregate themselves to parts of the same nature.

Length and Shortness of Life in Living Creatures.

The History.

To the first Article.

Touching the Length and Shortness of Life in Living Creatures, the Information which may be had is but slender, Observation is negligent, and Tradition fabulous. In Tame Creatures, their degenerate life corrupteth them; in Wild Creatures, their exposing to all Weathers often intercepteth them: Neither do those things which may seem Concomitants, give any furtherance to this Information, (the greatness of their Bodies, their time of Bearing in the Womb, the number of their Young ones, the time of their growth, and the rest) in regard that these things are intermixed, and sometimes they concur, sometimes they sever.

1. Mans age (as far as can be gathered by any certain Narration) doth exceed the age of all other Living Creatures, except it be of a very few only; and the Concomitants in him are very equally disposed, his stature and proportion large, his bearing in the Womb nine Months, his fruit commonly one at a birth, his puberty at the age of fourteen years, his time of growing till twenty.

2. The Elephant, by undoubted relation, exceeds the ordinary Race of Mans life; but his bearing in the Womb the space of ten years, is fabulous; of two years, or at least above one, is certain. Now his Bulk is great, his time of growth until the thirtieth year, his teeth exceeding hard; neither hath it been observed, that his blood is the coldest of all Creatures: His age hath sometimes reached to two hundred years.

3. Lyons are accounted long livers, because many of them have been found toothless, a sign not so certain, for that may be caused by their strong breath.

4. The Bear is a great sleeper, a dull Beast, and given to ease; and yet not noted for

for long life : nay, he hath this sign of short life, that his *bearing* in the *Womb* is but short, scarce full forty days.

The *Fox* seems to be well disposed in many things for long life : he is well skinned, feeds on flesh, lives in Dens, and yet he is noted not to have that property. Certainly he is a kind of *Dog*, and that kind is but short-liv'd.

The *Camel* is a long liver, a lean Creature, and finewy ; so that he doth ordinarily attain to fifty, and sometimes to an hundred years.

The *Horse* lives but to a moderate age, scarce to forty years ; his ordinary period is twenty years : but perhaps he is beholden for this shortness of life to *Man* ; for we have now no *Horses* of the *Sun* that live freely, and at pleasure, in good Pastures : Notwithstanding the *Horse* grows till he be six years old, and is able for Generation in his old age. Besides, the *Mare* goeth longer with her young one than a *Woman* ; and brings forth two at a burthen more rarely. The *Ass* lives commonly to the *Horse's* age ; but the *Male* out-lives them both.

The *Hart* is famous amongst men for long life, yet not upon any relation that is undoubted. They tell of a certain *Hart* that was found with a Collar about his neck, and that Collar hidden with *Fat*. The long life of the *Hart* is the less credible, because he comes to his perfection at the fifth year, and not long after his *Horns* (which he sheds, and renews yearly) grow more narrow at the Root, and less branched.

The *Dog* is but a short liver, he exceeds not the age of twenty years ; and, for the most part, lives not to fourteen years : a Creature of the hottest temper, and living in extremes ; for he is commonly either in vehement motion, or sleeping : besides, the *Bitch* bringeth forth many at a Burden, and goeth nine Weeks.

The *Oxe* likewise, for the greatness of his body and strength, is but a short liver, about some sixteen years, and the *Males* live longer than the *Females* ; notwithstanding they bear usually but one at a burden, and go nine months : a Creature dull, fleshy, and soon fatted, and living only upon Herby Substances, without Grain.

The *Sheep* seldom lives to ten years, though he be a Creature of a moderate size, and excellently clad ; and, that which may seem a Wonder, being a Creature with so little a Gall, yet he hath the most curled Coat of any other, for the hair of no Creature is so much curled as *Wool* is. The *Rams* generate not before the third year, and continue able for Generation until the eighth. The *Ewes* bear young as long as they live. The *Sheep* is a diseased Creature, and rarely lives to his full age.

The *Goat* lives to the same age with the *Sheep*, and is not much unlike in other things ; though he be a Creature more nimble, and of somewhat a firmer flesh, and so should be longer-liv'd, but then he is much more lascivious, and that shortens his life.

The *Sow* lives to fifteen years, sometimes to twenty : and though it be a Creature of the moistest flesh, yet that seems to make nothing to length of life. Of the *Wild-Boar*, or *Sow*, we have nothing certain.

The *Cat's* age is betwixt six and ten years : a Creature nimble, and full of spirit, whose seed (as *Ælian* reports) burneth the Female : whereupon it is said, *That the Cat conceives with pain, and brings forth with ease*. A Creature ravenous in eating, rather swallowing down his Meat whole, than feeding.

Hares and *Coney's* attain scarce to seven years, being both Creatures Generative, and with young ones of several Conceptions in their Bellies. In this they are unlike, that the *Coney* lives under ground, and the *Hare* above ground. And again, that the *Hare* is of a more dusky flesh.

Birds, for the size of their bodies, are much lesser than *Beasts* ; for an *Eagle* or *Swan* is but a small thing, in comparison of an *Oxe* or *Horse* ; and so is an *Estrich* to an *Elephant*.

Birds are excellently well clad : for *Feathers*, for warmth and close fitting to the body, exceed *Wool* and *Hairs*.

Birds, though they hatch many young ones together, yet they bear them not all in their bodies at once, but lay their Eggs by turns, whereby their Fruit hath the more plentiful nourishment whilst it is in their bodies.

Birds chew little or nothing, but their Meat is found whole in their Crops, notwithstanding they will break the shells of Fruits, and pick out the Kernels : they are thought to be of a very hot and strong Concoction.

20. The motion of *Birds* in their flying is a mixt motion, consisting of a moving of the limbs, and of a kind of carriage, which is the most wholesome kind of Exercise.
21. *Aristotle* noted well touching the Generation of *Birds*, (but he transferred it ill to other living Creatures) that the seed of the *Male* confers less to Generation than the *Female*, but that it rather affords Activity than Matter; so that fruitful Eggs, and unfruitful Eggs, are hardly distinguished.
22. *Birds* (almost all of them) come to their full growth the first year, or a little after. It is true, that their Feathers in some kinds, and their Bills in others, shew their years; but for the growth of their Bodies, it is not so.
23. The *Eagle* is accounted a long liver, yet his years are not set down, and it is alledged as a sign of his long life, that he casts his Bill, whereby he grows young again: from whence comes that old Proverb, *The old age of an Eagle*. Notwithstanding perchance the matter may be thus; that the renewing of the *Eagle* doth not cast his Bill, but the casting of his Bill is the renewing of the *Eagle*; for after that his Bill is grown to a great crookedness, the *Eagle* feeds with much difficulty.
24. *Vultures* are also affirmed to be long livers, inasmuch that they extend their life well near to an hundred years: *Kites* likewise, and so all *Birds* that feed upon flesh, and *Birds* of Prey, live long. As for *Hawks*, because they lead a degenerate and servile life for the delight of men, the term of their Natural life is not certainly known: notwithstanding amongst *Mewed Hawks* some have been found to have lived thirty years, and amongst *Wild Hawks* forty years.
25. The *Raven* likewise is reported to live long, sometimes to an hundred years: He feeds on Carrion, and flies not often, but rather is a seditious and melancholick Bird, and hath very black flesh. But the *Crow*, like unto him in most things, (except in greatness and voice) lives not altogether so long, and yet is reckoned amongst the long livers.
26. The *Swan* is certainly found to be a long liver, and exceeds not unfrequently an hundred years: He is a Bird excellently plumed, a feeder upon Fish, and is always carried, and that in running waters.
27. The *Goose* also may pass amongst the long livers, though his food be commonly Grass, and such kind of nourishment, especially the *Wild Goose*: whereupon this Proverb grew amongst the Germans, *Magis senex quam Anser nivalis*, Older than a *Wild Goose*.
28. *Storks* must needs be long livers, if that be true which was anciently observed of them, that they never came to *Thebes*, because that City was often sacked. This, if it were so, then either they must have the knowledge of more Ages than one, or else the Old Ones must tell their Young the History. But there is nothing more frequent than Fables.
29. For Fables do so abound touching the *Phoenix*, that the truth is utterly lost, if any such Bird there be. As for that which was so much admired, that she was ever seen abroad with a great troop of *Birds* about her, it is no such wonder; for the same is usually seen about an *Owl* flying in the day-time, or a *Parrot* let out of a Cage.
30. The *Parrot* hath been certainly known to have lived threescore years in *England*, how old soever he was before he was brought over; a Bird eating almost all kind of Meats, chewing his Meat, and renewing his Bill: Likewise curst and mischievous, and of a black flesh.
31. The *Peacock* lives twenty years, but he comes not forth with his *Argus Eyes* before he be three years old; a Bird slow of pace, having whitish flesh.
32. The *Dunghill-Cock* is Venerious, Martial, and but of a short life; a crank Bird, having also white flesh.
33. The *Indian-Cock*, commonly called the *Turkey-Cock*, lives not much longer than the *Dunghill-Cock*: an angry Bird, and hath exceeding white flesh.
34. The *Ring-Doves* are of the longest sort of livers, inasmuch that they attain sometimes to fifty years of Age: an Airy Bird, and both builds and sits on high. But *Doves* and *Turtles* are but short liv'd, not exceeding eight years.
35. But *Pheasants* and *Partridges* may live to sixteen years. They are great Breeders, but not so white of flesh as the ordinary Pullen.

The *Black Bird* is reported to be, amongst the lesser birds, one of the longest livers; an unhappy bird, and a good singer.

The *Sparrow* is noted to be of a very short life; and it is imputed in the Males to their lasciviousness. But the *Linnet*, no bigger in body than the *Sparrow*, hath been observed to have lived twenty years.

Of the *Estrich* we have nothing certain: those that were kept here have been so unfortunate, that no long life appeared by them. Of the bird *Ibis* we find onely that he liveth long, but his years are not recorded.

The age of *Fishes* are more uncertain than that of terrestrial Creatures, because living under the water they are the less observed: many of them breath not, by which means their vital spirit is more closed in; and therefore though they receive some refrigeration by their Gills, yet that refrigeration is not so continual as when it is by breathing.

They are free from the Desiccation and Depredation of the *Air ambient*, because they live in the water, yet there is no doubt but the *Water ambient*, and piercing, and received into the pores of the body, doth more hurt to long life than the *Air* doth.

It is affirmed too that their blood is not warm. Some of them are great devourers, even of their own kind. Their flesh is softer and more tender than that of terrestrial creatures: they grow exceedingly fat, insomuch that an incredible quantity of Oyl will be extracted out of one *Whale*.

Dolphins are reported to live about thirty years; of which thing a trial was taken in some of them by cutting off their tails: they grow until ten years of age.

That which they report of some *Fishes* is strange, that after a certain age their bodies will waste and grow very slender, onely their head and tail retaining their former greatness.

There were found in *Cæsar's* Fish ponds *Lampreys* to have lived threescore years: they were grown so familiar with long use, that *Craſſus* the Orator solemnly lamented one of them.

The *Pike* amongst *Fishes* living in Fresh water is found to last longest, sometimes to forty years: he is a Ravener, of a flesh somewhat dry and firm.

But the *Carp*, *Bream*, *Tench*, *Eel*, and the like, are not held to live above ten years.

Salmon are quick of growth, short of life; so are *Trouts*: but the *Pearch* is slow of growth, long of life.

Touching that Monstrous bulk of the *Whale* or *Ork*, how long it is weiled by vital spirit, we have received nothing certain; neither yet touching the *Sea calf*, and *Sea hog*, and other innumerable *Fishes*.

Crocodiles are reported to be exceeding long liv'd, and are famous for the times of their growth, for that they, amongst all other Creatures, are thought to grow during their whole life. They are of those Creatures that lay Eggs, ravenous, cruel, and well-fenced against the waters, Touching the other kinds of *Shell fish*, we find nothing certain how long they live.

Observation.

TO find out a Rule touching Length and Shortness of Life in Living Creatures is very difficult, by reason of the negligence of Observations, and the entermixing of Causes. A few things we will set down.

There are more kinds of Birds found to be long liv'd than of Beasts; as the *Eagle*, the *Vulture*, the *Kite*, the *Pellican*, the *Raven*, the *Crow*, the *Swan*, the *Goose*, the *Stork*, the *Crane*, the Bird called the *Ibis*, the *Parrot*, the *Ring-dove*, with the rest, though they come to their full growth within a year, and are less of bodies: surely their clothing is excellent good against the distemperatures of the weather; and besides, living for the most part in the open Air, they are like the Inhabitants of pure Mountains, which are long liv'd. Again, their Motion, which (as I else-where said) is a mixt Motion, compounded of a moving of their Limbs and of a carriage in the Air, doth less weary and wear them, and 'tis more wholesome. Neither do they suffer any compression or want of nourishment in their mother's bellies, because the Eggs are laid by turns. But the cheifest cause of all I take to be this, that Birds are made more of the substance of the Mother than of the Father, whereby their Spirits are not so eager and hot.

2.

It may be a Position, that Creatures which partake more of the substance of their Mother than of their Father are longer liv'd, as Birds are, which was said before. Also that those which have a longer time of bearing in the womb, do partake more of the substance of their Mother, less of the Father, and so are longer-liv'd: Insomuch that I am of opinion, that even amongst Men, (which I have noted in some) those that resemble their Mothers most are longest-liv'd; and so are the Children of Old men begotten of young Wives, if the Fathers be sound not diseased.

3.

The first breeding of Creatures is ever material, either to their hurt or benefit. And therefore it stands with reason, that the lesser Compression, and the more liberal Alimentation of the Young one in the womb, should confer much to Long Life. Now this happens when either the young ones are brought forth successively, as in Birds, or when they are single Birth, as in Creatures bearing but one at a Birthen.

4.

But long Bearing in the Womb makes for Length of Life three ways: First, for that the young one partakes more of the substance of the Mother, as hath been said. Secondly, that it comes forth more strong and able. Thirdly, that it undergoes the predatory force of the Air, later. Besides, it shews that Nature intendeth to finish her periods by larger Circles. Now though Oxen, and Sheep, which are born in the womb about six months, are but short-liv'd, that happens for other causes.

5.

Feeders upon Grass and mere Herbs are but short livers, and Creatures feeding upon Flesh, or Seeds, or Fruits, long livers, as some Birds are. As for Harts, which are long-liv'd, they take the one half of their meat (as men use to say) from above their heads, and the Goose, besides Grass, findeth something in the water, and Stubble to feed upon.

6.

We suppose that a good Cloathing of the Body maketh much to long life; for it fenceth and armeth against the intemperances of the Air, which do wonderfully assail, and decay the body: which benefit Birds especially have. Now that Sheep, which have so good Fleeces, should be so short-liv'd, that is to be imputed to Diseases, whereof that Creature is full, and to the bare eating of Grass.

7.

The seat of the Spirits, without doubt, is principally the Head; which thought it be usually understood of the Animal Spirits only, yet this is all in all. Again, it is not to be doubted but the Spirits do most of all waste and prey upon the body, so that when they are either in greater plenty, or in greater inflammation and Acrimony, there the life is much shortened. And therefore I conceive a great cause of long life in Birds to be the smallness of their Heads in comparison of their Bodies; for even Men which have very great Heads I suppose to be the shorter livers.

8.

I am of opinion that Carriage is of all other motions the most helpful to long life; which I also noted before. Now there are carried Water-fowls upon the water, as Swans; all Birds in their flying, but with a strong endeavour of their limbs; and Fishes, of the length of whose live we have no certainty.

9.

Those Creatures which are long before they come to their perfection (not speaking of growth in stature only, but of other steps to maturity; as Man puts forth, first, his Teeth, next the signs of Puberty, then his beard, and so forward) are long liv'd, for it shews that Nature finished her Periods by larger Circles.

10.

Milder Creatures are not long-liv'd, as the Sheep and Dove; for Choler is as the Whetstone and Spur to many Functions in the Body.

11.

Creatures whose Flesh is more dusky are longer-liv'd than those that have white Flesh; for it sheweth that the juice of the body is more firm, and less apt to dissipate.

12.

In every corruptible Body Quantity maketh much to the conservation of the whole: for a great Fire is longer in quenching, a small portion of Water is sooner evaporated, the Body of a Tree withereth not so fast as a Twig. And therefore generally (I speak it of Species, not of Individuals) Creatures that are large in body are longer-liv'd than those that are small, unless there be some other potent cause to hinder it.

Alimentation, or Nourishment : and the way of Nourishing.

The History.

Nourishment ought to be of an inferiour nature, and more simple substance than the thing nourished. *Plants* are nourished with the Earth and Water, *Living Creatures* with *Plants*, *Man* with living *Creatures*. There are also certain *Creatures* feeding upon *Flesh*, and *Man* himself, takes *Plants* into a part of his Nourishment ; but *Man* and *Creatures* feeding upon *Flesh* are scarcely nourished with *Plants* alone : perhaps *Fruit* or *Grains*, baked or boiled, may, with long use, nourish them ; but *Leaves*, or *Plants* or *Herbs* will not do it, as the *Order of Foliantes* shewed by Experience.

Over great Affinity or Consubstantiality of the Nourishment to the thing nourished proveth not well : *Creatures* feeding upon *Herbs* touch no *Flesh*, and of *Creatures* feeding upon *Flesh*, few of them eat their own kind : As for *Men*, which are *Canibals*, they feed not ordinarily upon *Mans* flesh, but reserve it as a Dainty, either to serve their revenge upon their enemies, or to satisfy their appetite at sometimes. So the Ground is best sown with *Seed* growing elsewhere, and *Men* do not use to Graft or Inoculate upon the same Stock.

By how much the more the Nourishment is better prepared, and approacheth nearer in likeness to the thing nourished, by so much the more are *Plants* more fruitful, and living *Creatures* in better liking and plight : for a young *Slip* or *Cion* is not so well nourished if it be pricked into the ground, as if it be grafted into a Stock agreeing with it in Nature, and where it finds the nourishment already digested and prepared : neither : (as is reported) will the *Seed* of an *Onion*, or some such like, sown in the bare earth, bring forth so large a fruit as if it be put into another *Onion*, which is a new kind of Grafting, into the root, or under ground. Again, it hath been found out lately, that a *Slip* of a *Wild Tree*, as of an *Elm*, *Oak*, *Ash*, or such like, grafted into a Stock of the same kind, will bring forth larger leaves than those that grow without grafting : Also *Men* are not nourished so well with raw flesh as with that which hath passed the fire.

Living Creatures are nourished by the Mouth, *Plants* by the Root, *Young ones* in the womb by the Navel : *Birds* for a while are nourished with the Yolk in the Egge, whereof some is found in their Crops after they are hatched.

All Nourishment moveth from the Centre to the Circumference, or from the Inward to the Outward : yet it is to be noted, that in *Trees* and *Plants* the Nourishment passeth rather by the Bark and Outward parts than by the Pith and Inward parts ; for if the Bark be pill'd off, though but for a small breadth, round, they live no more : and the Blood in the Veins of living *Creatures* doth no less nourish the *Flesh* beneath it than the *Flesh* above it.

In all Alimentation or Nourishment there is a two-fold Action, Extusion and Attraction ; whereof the former proceeds from the Inward Function, the latter from the Outward.

Vegetables assimilate their Nourishment simply, without Excerning : For Gums and Tears of *Trees* are rather Exuberances than Excrements, and Knots or knobs are nothing but Diseases. : But the substance of living *Creatures* is more perceptible of the like ; and therefore it is conjoined with a kind of disdain, whereby it rejecteth the bad, and assimilateth the good.

It is a strange thing of the stalks of *Fruits*, that all the Nourishment which produceth sometimes such great *Fruits*, should be forced to pass through so narrow necks ; for the Fruit is never joyn'd to the Stocks without some stalk.

It is to be noted, that the Seeds of living *Creatures* will not be fruitful but when they new shed, but the Seeds of *Plants* will be fruitful a long time after they are gathered ; yet the Slips or Cions of *Trees* will not grow unless they be grafted green neither will the roots keep long fresh unless they be covered with earth.

In living *Creatures* there are degrees of Nourishment according to their Age : in the womb, the young one is nourished with the Mother's blood ; when it is new-born, with Milk ; afterwards with Meats and Drinks ; and in old age the most nourishing and savoury Meats please best,

To the fourth Article.

1.

2.

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10.

Ab ove all it maketh to the present *Inquisition*, to inquire diligently and attentively whether a man may not receive *Nourishment* from without, at least some other way beside the Mouth. We know that Baths of Milk are used in some *Hectick Fevers*, and when the body is brought extream low, and *Physicians* do provide *Nourishing glysters*. This matter would be well studied; for if *Nourishment* may be made either from without, or some other way than by the stomach, then the weakness of Concoction, which is incident to old men, might be recompenced by these helps, and Concoction restored to them intire.

Length and Shortness of Life in Man.

The History:

To the 5, 6,
7, 8, 9, and
11 Articles.

1.

BEfore the *Flood*, as the *Sacred Scriptures* relate, Men lived many hundred years; yet none of the *Fathers* attained to a full thousand. Neither was this *Length of Life* peculiar onely to *Grace* or the *Holy Line*; for there are reckoned of the *Fathers* untill the *Flood* eleven Generations; but of the sons of *Adam* by *Cain* onely eight Generations; so as the posterity of *Cain* may seem the longer-liv'd. But this *Length of Life* immediately after the *Flood* was reduced to a moiety, but in the *Post-nati*; for *Noah*, who was born before, equalled the age of his *Ancestors*, and *Shem* saw the six hundredth year of his life. Afterwards, three Generations being run from the *Flood*, the *Life of Man* was brought down to a fourth part of the *primative Age*, that was, to about two hundred years.

2.

Abraham lived an hundred seventy and five years: a man of an high courage, and prosperous in all things. *Isaac*, came to an hundred and eighty years of age: a chaste man, and enjoying more quietness than his Father. But *Jacob*, after many crosses and a numerous progeny, lasted to the hundred forty seventh year of his life: a patient, gentle, and wise man. *Ismael*, a military man, lived an hundred thirty and seven years. *Sarah* (whose years onely amongst women are recorded) died in the hundred twenty seventh year of her age: a beautifull and magnanimous woman: a singular good Mother and Wife; and yet no less famous for her Liberty than Obsequiousness towards her husband. *Joseph* also, a prudent and politick man, passing his youth in affliction, afterwards advanced to the height of honour and prosperity, lived an hundred and ten years. But his brother *Levi*, elder than himself, attained to an hundred thirty seven years: a man impatient of contumely and revengful. Near unto the same age attained the son of *Levi*; also his grand child, the father of *Aaron* and *Moses*.

3.

Moses lived an hundred and twenty years: a stout man, and yet the meekest upon the earth and of a very slow tongue. Howsoever *Moses* in his *Psalms* pronounceth that the life of man is but seventy years, and if a man have strength, then eighty; which term of man's life standeth firm in many particulars even at this day. *Aaron*, who was three years the elder, died the same year with his Brother: a man of a readier speech, of a more facile disposition, and less constant. But *Phineas*, grand-child of *Aaron*, (perhaps out of extraordinary grace) may be collected to have lived three hundred years; if so be the war of the *Israelites* against the Tribe of *Benjamin* (in which Expedition *Phineas* was consulted with) were performed in the same order of time in which the *History* hath ranked it: He was a man of a most eminent Zeal. *Joshua*, a martial man and an excellent Leader, and evermore victorious, lived to the hundred and tenth year of his life. *Caleb* was his Contemporary, and seemeth to have been of as great years. *Ehud* the Judge seems to have been no less than an hundred years old in regard that after the Victory over the *Moabites* the *Ho'y Land* had rest under his Government eighty years: He was a man fierce and undaunted, and one that in a sort neglected his life for the good of his People.

4.

Job lived, after the restoration of his happiness, an hundred and forty years, being before his afflictions, of that age that he had sons at man's estate: a man politick

litick, Eloquent, Charitable, and the Example of Patience. *Eli* the Priest lived ninety eight years; a corpulent man, calm of disposition, and indulgent to his Children. But *Elizans* the Prophet may seem to have died when he was above an hundred years old: for he is found to have lived after the Assumption of *Elias* sixty years; and at the time of that Assumption he was of those years, that the Boys mocked him by the name of Bald head: A man vehement and severe, and of an austere life, and a contemner of Riches. Also *Isaiah* the Prophet seemeth to have been an hundred years old; for he is found to have exercised the Function of a Prophet seventy years together; the years both of his beginning to Prophecie, and of his Death; being uncertain: A man of an admirable Eloquence, an Evangelical Prophet, full of the Promises of God of the New Testament, as a Bottle with sweet Wine.

Tobias the Elder lived an hundred fifty eight years, the Younger an hundred twenty seven; merciful men, and great Alms-givers. It seems in the time of the Captivity, many of the Jews who returned out of *Babylon* were of great years, seeing they could remember both Temples, (there being no less than seventy years betwixt them) and wept for the unlikeness of them. Many Ages after that, in the time of our Saviour, lived old *Simeon*, to the Age of ninety; a devout man, and full both of hope and expectation. Into the same time also fell *Anna* the Prophetess, who could not possibly be less than an hundred years old; for she had been seven years a Wife, about eighty four years a Widow, besides the years of her Virginity, and the time that she lived after her Prophecy of our Saviour: She was an holy Woman, and passed her days in Fastings and Prayers.

The long lives of Men mentioned in *Heathen Authors* have no great certainty in them; both for the intermixture of Fables, whereunto those kind of relations were very prone, and for their false Calculation of Years. Certainly of the *Egyptians* we find nothing of moment in those works that are extant; as touching long life; for their Kings which reigned longest did not exceed fifty, or five and fifty years; which is no great matter, seeing many at this day attain to those years. But the *Arcadian Kings* are fabulously reported to have lived very long. Surely that Country was Mountainous, full of Flocks of Sheep, and brought forth most wholesome food; notwithstanding, seeing *Pan* was their god, we may conceive that all things about them were Panick and vain, and subject to Fables.

Numa, King of the *Romans*, lived to eighty years: a man peaceable, contemplative, and much devoted to Religion. *Marcus Valerius Corvinus* saw an hundred years compleat, there being betwixt his first and sixth Consulship forty six years: a man valorous, affable, popular, and always fortunate.

Solon of *Athens*, the Law-giver, and one of the seven Wise Men, lived above eighty years, a man of an high courage, but popular, and affected to his Country: also learned, given to pleasures, and a soft kind of life. *Epimenides* the *Cretian* is reported to have lived an hundred fifty seven years: the matter is mix'd with a Prodigious Relation, for fifty seven of those years he is said to have slept in a Cave. Half an Age after, *Xenophon* the *Colophonian* lived an hundred and two years, or rather more: for at the Age of twenty five years he left his Country, seventy seven compleat years he travelled, and after that returned: but how long he lived after his return, appears not; a man no less wandering in mind, than in body; for his name was changed for the madness of his Opinions, from *Xenophanes* to *Xenomanes*: a man, no doubt, of a vast conceit, and that minded nothing but *Infinitem*.

Anacreon, the Poet, lived eighty years, and somewhat better: a man lascivious, voluptuous, and given to drink. *Pindarus*, the *Theban*, lived to eighty years; a Poet of an high fancy, singular in his conceits, and a great Adorer of the gods. *Sophocles*, the *Athenian*, attained to the like Age: a lofty Tragick-Poet, given over wholly to Writing, and neglectful of his Family.

Artaxerxes, King of *Persia*, lived ninety four years: a man of a dull wit, averse to the dispatch of business, desirous of glory, but rather of ease. At the same time lived *Agefilaus*, King of *Sparta*, to eighty four years of Age: a moderate Prince, as being a Philosopher among Kings; but notwithstanding ambitious, and a Warriour, and no less stout in War, than in business.

Gorgias, the *Sicilian*, was an hundred and eight years old; a Rhetorician, and a great Boaster of his faculty, one that taught Youth for profit: He had seen many Countries,

Countries; and a little before his death said, *That he had done nothing worthy of blame since he was an old man.* Protagoras of Abdera saw ninety years of age. This man was likewise a Rhetorician, but professed not so much to teach the Liberal Arts as the Art of Governing Commonwealths and States; notwithstanding he was a great Wanderer in the World, no less than Gorgias. Isocrates, the Athenian, lived ninety eight years: he was a Rhetorician also, but an exceeding modest man; one that shunned the publick light, and opened his School only in his own house. Democritus of Abdera reached to an hundred and nine years: he was a great Philosopher; and, it ever any man amongst the Grecians, a true Naturalist; a Surveyour of many Countries, but much more of Nature: also a diligent Searcher into Experiments, and (as Aristotle objected against him) one that followed Similitudes more than the Laws of Arguments. Diogenes, the Sinopean, lived ninety years; a man that used Liberty towards others, but Tyranny over himself; a course Diet, and of much patience. Zeno of Citium lacked but two years of an hundred; a man of an high mind, and a Contemner of other mens Opinions: also of a great acuteness, but yet not troublesome; chusing rather to take mens minds, than to inforce them. The like whereof afterwards was in Seneca. Plato, the Athenian, attained to eighty one years; a man of a great courage, but yet a lover of ease: in his Notions sublimed, and of a fancy; neat and delicate in his life, rather calm than merry, and one that carried a kind of Majesty in his Countenance. Theophrastus, the Ereassian, arrived at eighty five years of age: a man sweet for his Eloquence, sweet for the variety of his matters, and who selected the pleasant things of Philosophy, and let the bitter and harsh go. Carneades of Cyrene, many years after, came to the like age of eighty five years: a man of a fluent Eloquence, and one who by the acceptable and pleasant variety of his knowledge, delighted both himself and others. But Orbilius, who lived in Cicero's time, no Philosopher or Rhetorician, but a Grammarian, attained to an hundred years of age: he was first a Soldier, then a Schoolmaster; a man by nature tart both in his Tongue and Pen, and severe towards his Scholars.

Quintus Fabius Maximus was Augur sixty three years, which shewed him to be above eighty years of age at his death; though it be true, that in the Augurship Nobility was more respected than Age: a Wise man, and a great Deliberator, and in all his proceedings moderate, and not without affability severe. Masinissa, King of Numidia, lived ninety years, and being more than eighty five got a Son: a daring man, and trusting upon his Fortune, who in his youth had tasted of the inconstancy of Fortune, but in his succeeding age was constantly happy. But Marcus Porcius Cato lived above ninety years of age: a man of an Iron Body and Mind; he had a bitter tongue, and loved to cherish Factions; he was given to Husbandry, and was to himself and his family a Physician.

Terenia, Cicero's Wife, lived an hundred and three years; a woman afflicted with many crosses: first, with the banishment of her Husband; then with the difference betwixt them: lastly, with his last fatal misfortune: She was also oftentimes vexed with the Gout. Lucia must needs exceed an hundred, by many years, for it is said, that she acted an whole hundred years upon the Stage, at first perhaps representing the person of some young Girl, at last of some decrepit old Woman. But Galeria Copiosa, a Player also, and a Dancer, was brought upon the Stage as a Novice, in what year of her age is not known; but ninety nine years after, at the Dedication of the Theatre by Pompey the Great, she was shewn upon the Stage, not now for an Actress, but for a Wonder. Neither was this all; for after that, in the Solemnities for the health and life of Augustus, she was shewn upon the Stage the third time.

There was another Actress, somewhat Inferiour in Age, but much Superiour in Dignity, which lived well near ninety years, I mean Livia Julia Augusta, Wife to Augustus Caesar, and Mother to Tiberius. For if Augustus his life were a Play, (as himself would have it, when as upon his Death bed he charged his Friends they should give him a Plaudire after he was dead) certainly this Lady was an excellent Actress, who could carry it so well with her Husband by a dissimuled obedience, and with her Son by Power and Authority: A Woman affable, and yet of a Matronal Carriage, Pragmatical, and upholding her Power. But Junia, the Wife of Caius Cassius, and Sister of Marcus Brutus, was also ninety years old, for she survived the Philippick Baile sixty four years: a Magnanimous Woman, in her great wealth happy,

happy in the calamity of her Husband, and near Kinsfolks, and in a long Widdowhood unhappy; notwithstanding much honoured of all.

The year of our Lord seventy six, falling into the time of *Vespasian*, is memorable; in which we shall find, as it were, a *Calendar* of long-liv'd men: for that year there was a *Taxing*, (now a *Taxing* is the most Authentical and truest Informer touching the Ages of men;) and in that part of *Italy* which lieth betwixt the *Apennine Mountains*, and the River *Poe*, there were found an hundred and four and twenty persons that either equalled or exceeded an hundred years of age: namely, of an hundred years just, fifty four persons; of an hundred and ten, fifty seven persons; of an hundred and five and twenty, two only; of an hundred and thirty, four men; of an hundred and five and thirty, or seven and thirty, four more; of an hundred and forty, three men. Besides these, *Parma* in particular afforded five; whereof three fulfilled an hundred and twenty years, and two an hundred and thirty: *Bruxels* afforded one of an hundred and twenty five years old: *Placentia* one, aged an hundred thirty and one: *Faventia* one woman, aged one hundred thirty and two. A certain Town, then called *Velleiatum*, situate in the Hills about *Placentia*, afforded ten; whereof six fulfilled an hundred and ten years of age, four an hundred and twenty. Lastly, *Rimini*, one of an hundred and fifty years, whose name was *Marcus Aponius*.

That our Catalogue might not be extended too much in length, we have thought fit, as well in those whom we have rehearsed, as in those whom we shall rehearse, to offer none under eighty years of Age. Now we have affixed to every one a true and short Character or Elogy; but of that sort whereunto, in our judgment, Length of Life (which is not a little subject to the manners and fortunes of men) hath some relation, and that in a twofold respect; either that such kind of men are for the most part long-liv'd, or that such men may sometimes be of long life, though otherwise not well disposed for it.

Amongst the *Roman* and *Grecian* Emperours, also the *French* and *Almain*, to these our days, which make up the number of well-near two hundred Princes, there are only four found that lived to eighty years of age: unto whom we may add the two first Emperours, *Augustus* and *Tiberius*; whereof the latter fulfilled the seventy and eighth year, the former the seventy and sixth year of his age, and might both perhaps have lived to fourscore, if *Livia* and *Caius* had been pleased. *Augustus* (as was said) lived seventy and six years: a man of moderate disposition; in accomplishing his designs vehement, but otherwise calm and serene; in meat and drink sober, in Venery intemperate, through all his life-time happy; and who about the thirtieth year of his Life had a great and dangerous sickness, insomuch as they despaired of life in him, whom *Antonius Musa*, the Physitian, when other Physitians had applied hot Medicines, as most agreeable to his disease, on the contrary cured with cold Medicines, which perchance might be some help to the prolonging of his life. *Tiberius* lived to be two years older: A man with lean Chapt, as *Augustus* was wont to say, for his Speech stuck within his Jaws, but was weighty. He was bloudy, a Drinker, and one that took Last into a part of his Diet; notwithstanding a great observer of his health, insomuch that he used to say, That he was a Fool, that after thirty years of age took advice of a Physitian. *Gordian* the Elder lived eighty years, and yet died a violent death, when he was scarce warm in his Empire: a man of an high spirit, and Renowned, Learned, and a Poet, and constantly happy throughout the whole course of his life, save only that he ended his days by a violent death. *Valerian*, the Emperour, was seventy six years of age before he was taken Prisoner by *Sapor* King of *Persia*. After his Captivity, he lived seven years in reproaches, and then died a violent death also: a man of a poor mind, and not valiant, notwithstanding lifted up in his own, and the opinion of men, but falling short in the performance. *Anastasius*, surnamed *Dicorm*, lived eighty eight years: he was of a settled mind, but too abject, and superstitious, and fearful. *Anicius Justinianus* lived to eighty three years: a man greedy of Glory, performing nothing in his own Person, but in the valour of his Captains happy and renowned: uxorious, and not his own man, but suffering others to lead him. *Helena* of *Britain*, Mother of *Constantine the Great*, was fourscore years old: a woman that intermeddled not in matters of State, neither in her Husbands nor Sons Reign, but devoted her self wholly to Religion; magnanimous, and perpetually flourishing. *Theodora* the Empress (who was Sister to *Zoes*,
E c Wife

15.

16.

Wife of *Monomachus*, and reigned alone after her decease) lived above eighty years : a Pragmatical Woman, and one that took delight in Governing ; fortunate in the highest degree, and through her good fortunes credulous.

17.

We will proceed now from these *Secular Princes*, to the *Princes in the Church*. *St. John*, an Apostle of our *Saviour*, and the *Beloved Disciple*, lived ninety three years. He was rightly denoted under the Emblem of the *Eagle*, for his piercing sight into the *Divinity*; and was a *Seraph* amongst the *Apostles*, in respect of his burning Love. *St. Luke* the *Evangelist* fulfilled fourscore and four years : an Eloquent man, and a Traveller ; *St. Paul's* inseparable Companion, and a *Physitian*. *Simeon*, the Son of *Cleophas*, called the *Brother of our Lord*, and Bishop of *Jerusalem*, lived an hundred and twenty years, though he was cut short by *Martyrdom* : a stout man, and constant, and full of good works. *Polycarpus*, Disciple unto the *Apostles*, and Bishop of *Smyrna*, seemeth to have extended his age to an hundred years and more, though he were also cut off by *Martyrdom* : a man of an high mind, of an Heroical patience, and unwearied with labours. *Dionysius Areopagita*, Contemporary to the Apostle *St. Paul*, lived ninety years : he was called the *Bird of Heaven* for his high flying *Divinity*; and was famous, as well for his Holy Life, as for his Meditations. *Aquila* and *Priscilla*, first *St. Paul* the *Apostles* Hosts, afterward his Fellow-helpers, lived together in a happy and famous Wedlock, at least to an hundred years of age apiece ; for they were both alive under *Pope Xistus* the First : a Noble Pair, and prone to all kind of Charity, who amongst other their comforts (which no doubt were great unto the first *Founders* of the *Church*) had this added, to enjoy each other so long in an happy Marriage. *St. Paul*, the *Hermit*, lived an hundred and thirteen years : now he lived in a Cave, his Diet was so slender and strict, that it was thought almost impossible to support Humane Nature therewithal : he passed his years only in Meditations and Soliloquies ; yet he was not illiterate, or an Idiot, but learned. Saint *Anthony*, the first Founder of *Monks*, or (as some will have it) the Restorer only, attained to an hundred and five years of age : a man devout and contemplative, though not unfit for Civil Affairs : his life was austere and mortifying, notwithstanding he lived in a kind of glorious solitude, and exercised a Command, for he had his *Monks* under him : And besides, many *Christians* and *Philosophers* came to visit him as a living Image, from which they parted not without some adoration. *St. Athanasius* exceeded the term of eighty years : a man of an Invincible Constancy, Commanding Fame, and not yielding to Fortune : He was free towards the Great Ones, with the People gracious and acceptable, beaten and practised to oppositions ; and in delivering himself from them, stout and wise. *St. Hierom*, by the consent of most Writers, exceeded ninety years of age : a man powerful in his Pen, and of a Manly Eloquence, variously learned both in the Tongues and Sciences ; also a Traveller, and that lived strictly towards his old age, in an estate private, and not dignified ; he bore high Spirits, and shined far out of obscurity.

18.

The *Popes* of *Rome* are in number, to this day, two hundred forty and one : Of so great a number, five only have attained to the age of fourscore years, or upwards : But in many of the first *Popes*, their full age was intercepted by the Prerogative and Crown of *Martyrdom*. *John* the twenty third, *Pope* of *Rome*, fulfilled the ninetieth year of his age ; a man of an unquiet disposition, and one that studied Novelty : he altered many things, some to the better, others only to the new, a great Accumulator of Riches and Treasures. *Gregory*, called the twelfth, created in Schism ; and not fully acknowledged *Pope*, died at ninety years. Of him, in respect of his short *Papacy*, we find nothing to make a Judgment upon. *Paul* the third lived eighty years and one ; a temperate man, and of a profound Wisdom : he was Learned, an Astrologer, and one that tended his health carefully : but, after the example of Old *Eli* the Priest, over-indulgent to his Family. *Paul* the fourth attained to the age of eighty three years : a man of an harsh Nature, and severe, of an haughty mind, and imperious, prone to anger ; his Speech was Eloquent, and ready. *Gregory* the thirteenth fulfilled the like age of eighty three years : an absolute good man, sound in mind and body ; politick, temperate, full of good works, and an Alms-giver.

19.

Those that follow are to be more promiscuous in their order, more doubtful in their Faith, and more barren of Observation. King *Arganthenius*, who reigned at *Cadix* in *Spain*,

Spain lived an hundred and thirty, or (as some would have it) an hundred and forty years, of which he reigned eighty. Concerning his Manners, Institution of his Life, and the time wherein he reigned, there is a general silence. *Cyniras* King of *Cyprus*, living in the *Island*, then termed the *Happy and Pleasant Island*, is affirmed to have attained to an hundred and fifty, or sixty years. Two *Latin Kings* in *Italy*, the Father, and the Son, are reported to have lived, the one eight hundred, the other six hundred years: but this is delivered unto us by certain *Philologists*, who, though otherwise credulous enough, yet themselves have suspected the truth of this matter, or rather condemned it. Others record some *Arcadian Kings* to have lived three hundred years: the Country, no doubt, is a place apt for long life, but the Relation I suspect to be Fabulous. They tell of one *Dando* in *Illyrium*, that lived without the inconveniences of Old Age to five hundred years. They tell also of the *Epians*, a part of *Ætolia*, that the whole Nation of them were exceeding long liv'd, insomuch that many of them were two hundred years old; and that one principal man amongst them, named *Litorius*, a man of a Gyant-like stature, could have told three hundred years. It is recorded, that on the top of the Mountain *Timolus*, anciently called *Tempsis*, many of the Inhabitants lived to an hundred and fifty years. We read that the *Sect* of the *Essians* amongst the *Jews*, did usually extend their life to an hundred years. Now that *Sect* used a single or abstemious Diet, after the rule of *Pythagoras*. *Apollonius Tyaneus* exceeded an hundred years; his face bewraying no such age: he was an admirable man, of the *Heathens* reputed to have something Divine in him, of the *Christians* held for a Sorcerer; in his Diet *Pythagorical*, a great traveller, much renowned, and by some adored as a god: notwithstanding, towards the end of his life, he was subject to many complaints against him, and reproaches, all which he made shift to escape. But lest his long life should be imputed to his *Pythagorical* Diet, and not rather that it was Hereditary, his Grandfather before him lived an hundred and thirty years. It is undoubted, that *Quintus Metellus* lived above an hundred years; and that after several *Consulships* happily administered, in his old age he was made *Pontifex Maximus*, and exercised those holy duties full two and twenty years: in the performance of which Rites his voice never failed, nor his hand trembled. It is most certain, that *Appian Cæcus* was very old; but his years are not extant, the most part whereof he passed after he was blind; yet this misfortune no whit lostned him, but that he was able to govern a numerous Family, a great Retinue and Dependence, yea, even the Commonwealth it self, with great stoutness. In his extream old age he was brought in a Litter into the *Senate house*, and vehemently dissuaded the Peace with *Pyrrhus*: the beginning of his Oration was very memorable, shewing an invincible spirit and strength of mind: *I have with great grief of mind (Fathers Conscript) these many years born my blindness, but now I could wish that I were deaf also, when I hear you speak to such dishonourable Treaties.* *Marcus Perperna* lived ninety eight years, surviving all those whose Suffrages he had gathered in the *Senate-house*, being *Consul*, I mean, all the *Senators* at that time; as also all those whom a little after, being *Consul*, he chose into the *Senate*, seven only being excepted. *Hiero*, King of *Sicily*, in the time of the second *Punick War*, lived almost an hundred years: a man moderate both in his Government, and in his Life; a worshipper of the gods, and a Religious Conserver of Friendship, liberal, and constantly fortunate. *Statilia*, descended of a Noble Family in the days of *Claudius*, lived ninety nine years. *Clodia*, the Daughter of *Osilius*, an hundred and fifteen. *Xenophilus*, an Ancient Philosopher, of the *Sect* of *Pythagoras*, attained to an hundred and six years, remaining healthful and vigorous in his old age, and famous amongst the *Vulgar* for his Learning. The *Islanders* of *Coreyra* were anciently accounted long liv'd, but now they live after the rate of other men. *Hipocrates Coss*, the famous Physician, lived an hundred and four years, and approved and credited his own Art by so long a life: a man that coupled Learning and Wisdom together, very conversant in Experience and Observation; one that haunted not after Words or Methods, but severed the very Nerves of Science, and so propounded them. *Demonax* a Philosopher, not only in Profession but Practice, lived in the days of *Adrian* almost to an hundred years: a man of an high mind, and a vanquisher of his own mind, and that truly and without affectation; a contemner of the World, and yet civil and courteous. When his Friends spake to him about his Burial, he said, *Take no care for my Burial, for Stench will bury a Carcase.* They replied, *Is it your*

mind than to be cast out to Birds and Dogs? He said again, Seeing in my life-time I endeavoured to my uttermost to benefit Men; what hurt is it, if when I am dead, I benefit Beasts? Certain Indian people, called *Pandora*, are exceedingly long-liv'd, even to no less than two hundred years. They add a thing more marvellous, that having, when they are Boys, an hair somewhat whitish, in their old age, before their grey hairs, they grow coal-black: though indeed this be every where to be seen; that they which have white hair whilst they are Boys, in their Mans Estate change their hairs into a darker colour. The *Seres*, another people of *India*, with their Wine of Palms, are accounted long livers, even to an hundred and thirty years. *Euphranor* the Grammarian grew old in his School, and taught Scholars when he was above an hundred years old. The Elder *Ovid*, Father to the Poet, lived ninety years, differing much from the disposition of his Son; for he contemned the Muses, and dissuaded his Son from Poetry. *Asinius Pollio*, intimate with *Augustus*, exceeded the age of an hundred years: a man of an unreasonable Profuseness, Eloquent, and a Lover of Learning; but vehement, proud, cruel, and one that made his private ends the centre of his thoughts. There was an opinion, that *Seneca* was an extream old man, no less than an hundred and fourteen years of Age: which could not possibly be; it being as improbable that a decrepit old man should be set over *Nero's* Youth, as on the contrary it was true, that he was able to manage with great dexterity the Affairs of State. Besides, a little before, in the midst of *Claudius* his Reign, he was banished Rome for Adulteries committed with some Noble Ladies, which was a Crime no way competent with so extream old age. *Johannes de Temporibus*, among all the men of our latter Ages, out of a Common Fame and Vulgar Opinion, was reputed long-liv'd, even to a Miracle; or rather, even to a Fable: his age hath been counted above three hundred years: He was by Nation a French-man, and followed the Wars under *Charles* the Great. *Garcins Aretine*, Great Grand-father to *Petrarch*, arrived at the age of an hundred and four years: he had ever enjoyed the benefit of good health; besides, at the last, he felt rather a decay of his strength, than any sickness or malady, which is the true resolution by old age. Amongst the *Venetians* there have been found not a few long livers, and those of the more eminent sort: *Franciscus Donatus*, Duke; *Thomas Contarenus*, Procurator of Saint Mark; *Franciscus Molinus*, Procurator also of Saint Mark, and others. But most memorable is that of *Cornarius* the *Venetian*, who being in his youth of a sickly body, began first to eat and drink by measure to a certain weight, thereby to recover his health: this Cure turned by use into a Diet, that Diet to an extraordinary long life, even of an hundred years, and better, without any decay in his Senses, and with a constant enjoying of his health. In our age, *William Postel*, a French-man, lived to an hundred and well-nigh twenty years, the top of his Beard on the upper lip being black, and not grey at all: a man crazed in his Brain, and of a Fancy not altogether sound; a great Traveller, Mathematician, and somewhat stained with Heresie.

20. I suppose there is scarce a Village with us in England, if it be any whit populous, but it affords some Man or Woman of fourscore years of age; nay, a few years since there was in the County of Hereford a May-game, or Morrice-dance, consisting of eight men whose age computed together, made up eight hundred years; insomuch that what some of them wanted of an hundred, others exceeded as much.

21. In the Hospital of *Bethlehem*, corruptly called *Bedlam*, in the Suburbs of London, there are found from time to time many mad persons that live to a great age.

22. The ages of Nymphs, Fauns, and Satyrs, whom they make to be indeed mortal, but yet exceedingly long-liv'd, (a thing which Ancient Superstition, and the late Credulity of some have admitted) we account but for Fables and Dreams, especially being that which hath neither consent with Philosophy, nor with Divinity. And as touching the History of Long Life in Man by Individuals, or next unto Individuals, thus much. Now we will pass on to Observations by certain Heads.

23. The running on of Ages, and Succession of Generations, seem to have no whit abated from the length of life: For we see, that from the time of *Moses*, unto these our days, the term of mans life hath stood about fourscore years of age; neither hath it declined (as a man would have thought) by little and little. No doubt there are times in every Country, wherein men are longer or shorter-liv'd. Longer,

Longer, for the most part, when the times are barbarous, and men fare less deliciously, and are more given to bodily exercises: Shorter, when the times are more civil, and men abandon themselves to luxury and ease. But these things pass on by their turns, the succession of Generations alters it not. The same, no doubt, is in other living Creatures; for neither Oxen, nor Horses, nor Sheep, nor any the like, are abridged of their wonted Ages at this day: And therefore the Great abridger of Age was the Flood; and perhaps some such notable accidents (as particular Inundations, long Droughts, Earthquakes, or the like) may do the same again. And the like reason is in the dimension and stature of bodies, for neither are they lessened by succession of Generations; howsoever Virgil (following the Vulgar opinion) divined, that After-ages would bring forth lesser Bodies than the then present: Whereupon speaking of ploughing up the *Æmilian* and *Æmilian* Fields, he saith, *Grandiæque effossis mirabitur ossa Sepulchris*, That after ages shall admire the great bones digged up in Ancient Sepulchres. For whereas it is manifested, that there were heretofore men of Gigantine Statures, (such as for certain have been found in Sicily, and elsewhere, in Ancient Sepulchres and Caves) yet within these last three thousand years, a time whereof we have sure memory, those very places have produced none such: although this thing also hath certain turns and changes, by the civilizing of a Nation; no less than the former. And this is the rather to be noted, because men are wholly carried away with an Opinion, that there is a continual decay by succession of Ages; as well in the term of mans Life, as in the stature and strength of his Body; and that all things decline and change to the worse.

In *Call* and Northern Countries men live longer commonly than in *Hot*; which must needs be, in respect the skin is more compact and close, and the juices of the body less dissipable, and the Spirits themselves less eager to consume, and in better disposition to repair, and the Air (as being little heated by the Sun-beams) less predatory: And yet under the *Æquinoctial Line*, where the Sun passeth to and fro, and causeth a double Summer, and double Winter, and where the Days and Nights are more equal, (if other things be concurring) they live also very long; as in *Pern*, and *Taprobane*.

Islanders are, for the most part, longer liv'd than those that live in *Continents*: for they live not so long in *Russia*, as in the *Orcades*; nor so long in *Africa*, though under the same Parallel, as in the *Canaries* and *Tercera's*; and the *Japonians* are longer liv'd than the *Chineses*, though the *Chineses* are made upon long life. And this thing is no marvel, seeing the Air of the Sea doth heat and cherish in cooler Regions, and cool in hotter.

High Scituations do rather afford long livers than Low, especially if they be not tops of Mountains, but Rising Grounds, as to their general Scituations; such as was *Arcadia* in *Greece*, and that part of *Ætolia* where we related them to have lived so long. Now there would be the same reason for Mountains themselves, because of the pureness and clearness of the Air, but that they are corrupted by accident; namely, by the vapours rising thither out of the Valleys, and resting there; and therefore in Snowy Mountains there is not found any notable long life, not in the *Alps*, not in the *Pyrenean Mountains*, not in the *Apennine*: yet in the tops of the Mountains running along towards *Æthiopia*, and the *Abyssines*, where by reason of the Sands beneath, little or no vapour riseth to the Mountains: they live long, even at this very day, attaining many times to an hundred and fifty years.

Marshes and Fens are propitious to the Natives, and malignant to Strangers, as touching the lengthning and shortning of their lives: and that which may seem more marvellous, *Salt-marshes*, where the Sea ebbs and flows, are less wholesome than those of *Fresh-water*.

The Countries which have been observed to produce long livers, are these, *Arcadia*, *Ætolia*, *India* on this side *Ganges*, *Brasil*, *Taprobane*, *Britain*, *Ireland*, with the Islands of the *Orcades* and *Hebrides*: for as for *Æthiopia*, which by one of the Ancients is reported to bring forth long livers, 'tis but a Toy.

It is a Secret; The healthfulness of Air, especially in any perfection, is better found by Experiment, than by Discourse, or Conjecture. You may make a tryal by a Lock of Wooll exposed for a few days in the open Air, if the weight be not much increased;

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increased; another by a piece of flesh exposed likewise, if it corrupt not over-soon; another by a Weather-glass, if the Water interchange not too suddenly. Of these, and the like, enquire further.

30. Not only the *Goodness* or *Pureness* of the *Air*, but also the *Equality* of the *Air*, is material to long life. Intermixture of Hills and Dales, is pleasant to the sight, but suspected for long life. A Plain, moderately dry, but yet not over barren or sandy, nor altogether without Trees and Shade, is very convenient for length of life.

31. *Inequality* of *Air* (as was even now said) in the place of our dwelling is naught; but *Change* of *Air* by travelling, after one be used unto it, is good, and therefore great Travellers have been long liv'd. Also those that have lived perpetually in a little Cottage, in the same place, have been long livers: for Air accustomed consumeth less, but Air changed nourisheth and repaireth more.

32. As the continuation and number of Successions (which we said before) makes nothing to the length and shortness of life; so the *immediate condition* of the Parents, (as well the Father as the Mother) without doubt availeth much. For some are begotten of old men, some of young men, some of men of middle age: Again, some are begotten of Fathers healthful and well-disposed, others of diseased and languishing. Again, some of Fathers immediately after Repletion, or when they are Drunk; others after Sleeping, or in the Morning: Again, some after a long intermission of *Venus*, others upon the act repeated: Again, some in the fervency of the Fathers love, (as it is commonly in Bastards) others after the cooling of it, as in long-married Couples. The same things may be considered on the part of the Mother, unto which must be added the condition of the Mother whilst she is with child, as touching her Health, as touching her Diet, the time of her bearing in the Womb, to the tenth Month, or earlier. To reduce these things to a Rule, how far they may concern *Long Life*, is hard, and so much the harder, for that those things which a man would conceive to be the best, will fall out to the contrary: For that alacrity in the Generation which begets lusty and lively children, will be less profitable to long life, because of the Acrimony and inflaming of the Spirits. We said before, that to partake more of the Mothers Blood, conduceth to long life: Also we suppose all things in moderation to be best; rather Conjugal love than Meretricious; the hour for Generation to be the Morning; a state of body not too lusty or full, and such like. It ought to be well observed, that a strong Constitution in the Parents, is rather good for them than for the Child, especially in the Mother: And therefore *Plato* thought ignorantly enough, that the virtue of Generations halted, because the Woman used not the same exercise both of mind and body with the Men. The contrary is rather true; for the difference of virtue betwixt the Male and the Female, is most profitable for the Child, and the thinner Women yield more towards the nourishment of the Child, which also holds in Nurses. Neither did the *Spartan Women*, which married not before twenty two, or, as some say, twenty five, (and therefore were called *Man-like women*) bring forth a more generous or long-liv'd Progeny than the *Roman*, or *Athenian*, or *Theban Women* did, which were ripe for Marriage at twelve or fourteen years; and if there were any thing eminent in the *Spartans*, that was rather to be imputed to the Parsimony of their Diet, than to the late Marriages of their Women. But this we are taught by experience, that there are some Races which are long-liv'd for a few Descents, so that Life is like some Diseases, a thing Hereditary within certain bounds.

33. Fair in Face, or Skin, or Hair, are shorter livers: Black, or Red, or Freckled, longer. Also too fresh a colour in Youth doth less promise long life than paleness. A hard Skin is a sign of long life rather than a soft: but we understand not this of a rugged Skin, such as they call the *Goose-skin*, which is as it were spongy; but of that which is hard and close. A Forehead with deep furrows and wrinkles, is a better sign than a smooth and plain Forehead.

34. The Hairs of the Head hard, and like bristles, do betoken longer life than those that are soft and delicate. Curled Hairs betoken the same thing, if they be hard withal; but the contrary, if they be soft and shining; the like if the Curling be rather thick in large bunches.

35. Early or late Baldness is an indifferent thing, seeing many which have been

Bald

Bald betimes have lived long. Also early *grey hairs* (howsoever they may seem fore-runners of old age approaching) are no sure signs; for many that have grown *grey* betimes, have lived to great years: nay, *hasty grey hairs* without *Baldness*, is a token of long life; contrarily, if they be accompanied with *Baldness*.

Hairiness of the upper parts is a sign of short life, and they that have extraordinary much *hair* on their breasts live not long: but *hairiness* of the lower parts, as of the Thighs and Legs, is a sign of long life.

Talness of *Stature* (if it be not immoderate) with convenient making, and not too slender, especially if the body be active withal, is a sign of long life. Also on the contrary, men of low stature live long, if they be not too active and stirring.

In the proportion of the body, they which are *short* to the *Waists*, with *long Legs*, are longer-lived than they which are *long* to the *Waists*, and have *short Legs*. Also they which are large in the *neather parts*, and straight in the upper, (the making of their body rising, as it were, into a sharp figure) are longer-lived than they that have *broad shoulders*; and are *slender downwards*.

Leanness, where the affections are settled, calm, and peaceable: also a more *fat habit* of body, joynd with *Choler*, and a disposition stirring and pre-emptory, signifie long life: but *Corpulency* in Youth foreshews short life; in Age it is a thing more indifferent.

To be *long* and *slow* in growing; is a sign of long life; if to a greater stature, the greater sign; if to a lesser stature, yet a sign: though contrarily, to grow quickly to a great stature is an evil sign; if to a small stature, the less evil.

Firm Flesh, a raw-bone body, and veins lying higher than the flesh, betoken long life; the contrary to these, short life.

A *Head* somewhat lesser than to the proportion of the body, a moderate *Neck*, not long, nor slender, nor flat, nor too short; wide *Nostrils*, whatsoever the form of the *Nose* be; a large *Mouth*, and *Ears* grisly, not fleshy: *Teeth* strong and contiguous, small, or thin set, foretold long life; and much more, if some new *Teeth* put forth in our Elder years.

A broad *Breast*, yet not bearing out, but rather bending inwards; *Shoulders* somewhat crooked, and (as they call such persons) round-back'd; a flat *Belly*, a *Hand* large, and with few lines in the *Palm*; a short and round *Foot*, *Thighs* not fleshy, and *Calves* of the *Legs* not hanging over, but neat, are signs of long life.

Eyes somewhat large, and the *Circles* of them inclined to greenness; *Senses* not too quick; the *Pulse* in youth slower, towards old age quicker; *Facility* of holding the *Breath*, and longer than usual; the body in youth inclined to be bound; in the decline of years more laxative, are also signs of long life.

Concerning the *Times* of *Nativity*, as they refer to long life, nothing hath been observed worthy the setting down, save only *Astrological Observations*, which we rejected in our *Opicks*. A *Birth* at the eighth Month is not only long-lived, but not likely to live. Also *Winter-births* are accounted the longer-lived.

A *Pythagorical* or *Monastical Diet*, according to strict Rules, and always exactly equal, (as that of *Cornarus* was) seemeth to be very effectual for long life. Yet on the contrary, amongst those that live freely, and after the common sort, such as have good *stomachs*, and feed more plentifully, are often the longest-lived. The *middle Diet*, which we account the temperate, is commended, and conduceth to good health; but not to long life: for the *spare Diet* begets few *Spirits*, and dull, and so wasteth the body less; and the *liberal Diet* yieldeth more ample nourishment, and so repaireth more: but the *middle Diet* doth neither of both; for where the *Extreams* are hurtful, there the *Mean* is best; but where the *Extreams* are helpful, there the *Mean* is nothing worth.

Now to that *spare Diet* there are requisite *Watching*, lest the *Spirits* being few, should be oppressed with much sleep; *little Exercise*, lest they should exhale; *abstinence* from *Venery*, lest they should be exhausted: but to the *liberal Diet*, on the other side, are requisite much *Sleep*, frequent *Exercises*, and a seasonable use of *Venery*. *Baths* and *Anointings* (such as were anciently in use) did rather tend to deliciousness, than to prolonging of life. But of all these things we shall speak more exactly when we come to the *Inquisition*, according to *Intentions*. Mean while that of *Celsus*, who was not only a Learned Physitian, but a wise man, is not to be omitted, who adviseth interchanging and alternation of the *Diet*, but still with an inclination to the more Benign: as that a man should sometimes accustom himself to watching,

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watching, sometimes to sleep, but to sleep ofteneft. Again, that he should sometimes give himself to fasting, sometimes to feasting, but to feasting ofteneft: that he should sometimes inure himself to great labours of the mind, sometimes to relaxations of the same, but to relaxations ofteneft. Certainly this is without all question, that *Diet* well ordered bears the greatest part in the prolongation of life: neither did I ever meet an extreme long-liv'd man, but being asked of his course, he observed something peculiar; some one thing, some another. I remember an *Old Man*, above an hundred years of age, who was produced, as Witness, touching an ancient Prescription. When he had finished his Testimony, the Judge familiarly asked him how he came to live so long: He answered, beside expectation, and not without the laughter of the hearers, *By eating before I was hungry, and drinking before I was dry.* But of these things we shall speak hereafter.

47. A Life led in Religion, and in Holy Exercises, seemeth to conduce to long life. There are in this kind of life these things, Leisure, Admiration, and Contemplation of Heavenly things, Joys not sensual, Noble hopes, wholesome fears, sweet sorrows. Lastly, continual Renovations by Observances, Penances, Expiations: all which are very powerful to the prolongation of life. Unto which if you add that austere Diet which hardneth the mass of the Body, and humbl-eth the Spirits, no marvel if an extraordinary length of life do follow: such was that of *Paul the Hermite*, *Simeon Stelita the Columnar Anchorite*, and of many other *Hermites* and *Anchorites*.

48. Next unto this is the life led in good Letters, such as was that of Philosophers, Rhetoricians, Grammarians. This life is also led in leisure, and in those thoughts, which, seeing they are severed from the affairs of the world, bite not, but rather delight, through their variety and impertinency: They live also at their pleasure, spending their time in such things as like them best, and for the most part in the company of young men, which is ever the most chearful. But in Philosophies there is great difference betwixt the Sects, as touching long life: For those Philosophies which have in them a touch of Superstition, and are conversant in high Contemplations, are the best, as the *Pythagorical* and *Platonick*: Also those which did institute a perambulation of the World, and considered the variety of natural things, and had reachless, and high, and magnanimous thoughts, (as of *Infinitum*, of the Stars, of the Heroical Vertues, and such like) were good for lengthning of life: such were those of *Democritus Philolaus*, *Xenophanes*, the *Astrologians* and *Stoicks*. Also those which had no profound Speculation in them, but discoursed calmly on both sides, out of common Sense, and the received Opinions, without any sharp Inquisitions, were likewise good: such were those of *Carneades*, and the *Academicks*: also of the Rhetoricians and Grammarians. But contrary, Philosophies conversant in perplexing Subtilties, and which pronounced peremptorily, and which examined and wrested all things to the Scale of Principles. Lastly, which were thorny and narrow, were evil: such were those commonly of the *Peripateticks*, and of the *School-men*.

49. The Country-life also is well fitted for long life: it is much abroad, and in the open air; it is not slothful, but ever in employment; it feedeth upon fresh Cates, and unbought; it is without Cares and Envy.

50. For the Military life, we have a good Opinion of that whilst a man is young. Certainly many excellent Warriors have been long liv'd; *Corvinus*, *Camillus*, *Xenophon*, *Agessitans*, with others, both Ancient and Modern. No doubt it furthereth long life, to have all things from our Youth to our Elder Age mend, and grow to the better, that a Youth full of crosses may minister sweetness to our Old Age. We conceive also, that Military affections, inflamed with a desire of Fighting, and hope of Victory, do infuse such a heat into the Spirits, as may be profitable for long life.

Medicines for Long Life.

The Art of Physick, which we now have, looks no further commonly than to Conservation of Health, and Cure of Diseases: As for those things which tend properly to Long Life, there is but slight mention, and by the way only. Notwithstanding, we will propound these Medicines which are notable in this kind, I mean, those which are Cordials. For it is consonant to reason, that those things which being taken in Cures do defend and fortifie the Heart, or, more truly, the Spirits, against Poysons and Diseases, being transferred with Judgment and Choice into Diet, should have a good effect, in some sort, towards the Prolonging of Life. This we will do, not heaping them promiscuously together, (as the manner is) but selecting the best.

To the tenth Article.

Gold is given in three forms; either in that which they call *Aurum potabile*, or in Wine wherein Gold hath been quenched, or in Gold in the Substance, such as are Leaf-gold, and the Filings of Gold. As for *Aurum potabile*, it is used to be given in desperate or dangerous diseases, and that not without good success. But we suppose that the Spirits of the Salt, by which the Gold is dissolved, do rather minister that vertue which is found in it, than the Gold it self, though this secret be wholly suppressed. Now if the body of Gold could be opened with these Corrosive waters, or by these Corrosive waters (so the venomous quality were wanting) well washed, we conceive it would be no unprofitable Medicine.

1.

Pearls are taken either in a fine Powder, or in a certain Mass, or Dissolution, by the juice of four and new Lemons; and they are given sometimes in Aromatical Confections, sometimes in Liquor. The Pearl, no doubt, hath some affinity with the Shell in which it groweth, and may be of the same quality with the Shells of *Cra-fishes*.

2.

Amongst the transparent precious Stones, two only are accounted Cordial, the *Emerauld*, and the *Jacinth*, which are given under the same forms that the Pearls are; save only that the dissolutions of them, as far as we know, are not in use. But we suspect these *Glassie Jewels*, lest they should be cutting.

3.

Of these which we have mentioned, how far, and in what manner they are helpful, shall be spoken hereafter.

Bezoar-stone is of approved vertue for refreshing the Spirits, and procuring a gentle Sweat. As for the *Unicorn's Horn*, it hath lost the credit with us; yet so, as it may keep rank with *Hart's Horn*, and the *Bone* in the heart of a *Hart*, and *Ivory*, and such like.

4.

Amber-greece is one of the best to appease and comfort the Spirits.

Hereafter follow the names only of the *Simple Cordials*, seeing their Vertues are sufficiently known.

5.

Hot.	Hot.	Cold.	Cold.
Saffron.	Clove-Gilly-flow'rs	Nitre.	Juice of sweet
Folium Indam.	Orange flowers.	Roses. Violets.	Oranges.
Lignum Aloes.	Rosemary.	Strawberry-	Juice of Pearmains.
Citron Pill or	Mint.	leaves.	Borage.
Rind.	Betony.	Strawberries.	Bugloss.
Balm.	Carduus Benedi-	Juice of sweet	Burnet. Sanders.
Basil.	cus.	Lemons.	Camphire.

Seeing our speech now is of those things which may be transferred into Diet, all Hot Waters, and Chymical Oyls, (which, as a certain Trifler saith, are under the Planet Mars, and have a furious and destructive force) as also all hot and biting Spices are to be rejected, and a consideration to be had, how Waters and Liquors may be made of the former Simples: not those phlegmatick distilled Waters, nor again those burning Waters of Spirits of Wine, but such as may be more temperate, and yet lively, and sending forth a benign Vapour.

I make some question touching the frequent letting of Blood, whether it conduceth to long life or not; and I am rather in the opinion that it doth, if it be turned into a habit, and other things be well disposed; for it letteth out the old juice of the body, and bringeth in new.

6.

I suppose also, that some Emaciating Diseases well cured, do profit to long life, for they yield new Juice, the old being consumed; and as (he saith) To recover a sickness, is to renew Youth: Therefore it were good to make some Artificial Diseases, which is done by strict and Emaciating Diets, of which I shall speak hereafter.

The Intentions.

To the 12,
13, and 14
Article.

HAVING finished the Inquisition according to the Subjects, as namely, of Inanimate Bodies, Vegetables, Living Creatures, Man; I will now come nearer to the matter, and order mine Inquisitions by certain Intentions, such as are true and proper, (as I am wholly perswaded) and which are the very paths to Mortal Life. For in this part, nothing that is of worth hath hitherto been inquired, but the Contemplations of men have been but simple, and non-proficients. For when I hear men on the one side speak of comforting Natural heat, and the Radical Moisture, and of Meats which breed good Blood, such as may neither be burnt nor phlegmatick, and of the chearing and recreating the Spirits, I suppose them to be no bad men which speak these things; but none of these worketh effectually towards the end. But when on the other side I hear several discourses touching Medicines made of Gold, because Gold is not subject to corruption; and touching Precious Stones, to refresh the spirits by their hidden properties and lustre, and that if they could be taken and retained in Vessels, the Balloms and Quintessences of living Creatures would make men conceive a proud hope of Immortality. And that the Flesh of Serpents and Harts, by a certain consent, are powerful to the Renovation of Life, because the one casteth his Skin, the other his Horns: (they should also have added the Flesh of Eagles, because the Eagle changes his Bill) And that a certain Man, when he had found an Oyntment hidden under the ground, and had anointed himself therewith from head to foot, (excepting only the soles of his feet) did, by his anointing, live three hundred years without any disease, save only some Tumours in the soles of his feet: And of Artelius, who when he found his Spirit ready to depart, drew into his body the Spirit of a certain young man, and thereby made him breathless, but himself lived many years by another mans Spirit: And of Fortunate Hours, according to the Figures of Heaven, in which Medicines are to be gathered and compounded for the prolongation of Life: and of the Seals of Planets, by which virtues may be drawn and fetched down from Heaven to prolong Life; and such like fabulous and superstitious vanities: I wonder exceedingly that men should so much dote, as to suffer themselves to be deluded with these things. And again, I do pity Mankind that they should have the hard fortune to be besieged with such frivolous and senseless apprehensions. But mine Intentions do both come home to the matter, and are far from vain and credulous imaginations; being also such, as I conceive, Posterity may add much to the matters which satisfy these Intentions; but to the Intentions themselves, but a little. Notwithstanding there are a few things, and those of very great moment, of which I would have men to be forewarned.

First, We are of that Opinion, that we esteem the Offices of Life to be more worthy than Life it self: Therefore if there be any thing of that kind that may indeed exactly answer our Intentions, yet so, that the Offices and Duties of Life be thereby kindred, whatsoever it be of this kind, we reject it. Perhaps we may make some light mention of some things, but we insist not upon them. For we make no serious nor diligent discourse, either of leading the life in Caves, where the Sun beams, and several changes of the Air pierce not, like Epimenides his Cave; or of perpetual Baths, made of Liquors prepared; or of Shirts and Sear-cloths so applied, that the Body should be always, as it were, in a Box; or of thick paintings of the Body, after the manner of some Barbarous Nations; or of an exact ordering of our Life and Diet, which aimeth only at this, and mindeth nothing else but that a man live, (as was that of Herodicus amongst the Ancients, and of Cornarus the Venetian in our days, but with greater moderation;) or of any such Prodigy, Tediumness, or Inconvenience: but we propound such Remedies and Precepts, by which the Offices of Life may neither be deserted, nor receive any great interruptions or molestations.

Secondly,

Secondly, On the other side, we denounce unto men, that they will give over trifling, and not imagine that so great a work, as the stopping and turning back the powerful course of Nature, can be brought to pass by some Morning draught, or the taking of some precious Drug, but that they would be assured that it must needs be, that this is a work of labour, and consisteth of many Remedies, and a fit connexion of them amongst themselves; for no man can be so stupid as to imagine, that what was never yet done, can be done, but by such ways as were never yet attempted.

Thirdly, We ingeniously profess, that some of those things which we shall propound, have not been tried by us by way of Experiment, (for our course of life doth not permit that) but are derived (as we suppose) upon good Reasons, out of our Principles and Grounds, (of which some we set down, others we reserve in our mind) and are, as it were, cut and digged out of the Rock and Mine of Nature her self. Nevertheless we have been careful, and that with all providence and circumspection, (seeing the Scripture saith of the Body of Man, that it is more worth than Rayment) to propound such Remedies, as may at least be safe, if peradventure they be not fruitful.

Fourthly, We would have men rightly to observe and distinguish, that those things which are good for an Healthful Life, are not always good for a Long Life; for there are some things which do further the alacrity of the Spirits, and the strength and vigour of the Functions, which notwithstanding, do cut off from the sum of Life: and there are other things which are profitable to prolongation of Life, which are not without some peril of health, unless this matter be salved by fit Remedies; of which, notwithstanding, as occasion shall be offered, we will not omit to give some Cautions and Monitions.

Lastly, We have thought good to propound sundry Remedies according to the several Intentions; but the choice of those Remedies, and the order of them, to leave to discretion: for to set down exactly which of them agreeth best, with which Constitution of Body, which with the several courses of Life, which with each mans particular Age, and how they are to be taken one after another, and how the whole Practique of these things is to be administered and governed, would be too long, neither is it fit to be published.

In the Topicks we propounded three Intentions: The Prohibiting of Consumption, the Perfecting of Reparation, and the Renewing of Oldness. But seeing those things which shall be said are nothing less than words, we will deduce these three Intentions to ten Operations.

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| The first is, the Operation upon the Spirits, that they may renew their vigour. | 1. |
| The second Operation is upon the Exclusion of Air. | 2. |
| The third Operation is upon the Bloud, and the Sanguifying Heat. | 3. |
| The fourth Operation is upon the Juices of the Body. | 4. |
| The fifth Operation is upon the Bowels, for their Extrusion of Aliment. | 5. |
| The sixth Operation is upon the Outward Parts, for their Attraction of Aliment. | 6. |
| The seventh Operation is upon the Aliment it self, for the Insinuation thereof. | 7. |
| The eighth Operation is upon the last Act of Assimilation. | 8. |
| The ninth Operation is upon the Inteneration of the Parts, after they begin to be dried. | 9. |
| The tenth Operation is upon the Purging away of Old Juice, and supplying of New Juice. | 10. |

Of these Operations, the four first belong to the first Intention, the four next to the second Intention, and the two last to the third Intention.

But because this part touching the Intentions doth tend to Practice, under the name of History, we will not only comprise Experiments and Observations, but also Counsels, Remedies, Explications of Causes, Assumptions, and whatsoever hath reference hereunto.

*The Operation upon the Spirits, that they may remain
Youthful, and renew their Vigour.*

The History.

1. **T**HE *Spirits* are the Master-workmen of all effects in the *Body*: This is manifest by consent, and by infinite instances.
2. If any man could procure that a young mans *Spirit* could be conveyed into an old mans *Body*, it is not unlikely but this great Wheel of the *Spirits* might turn about the lesser Wheel of the *Parts*, and so the Course of Nature become Retrograde.
3. In every Consumption, whether it be by Fire, or by Age, the more the *Spirit* of the *Body*, or the heat, preyeth upon the moisture, the lesser is the duration of that thing. This occurs every where, and is manifest.
4. The *Spirits* are to be put into such a temperament and degree of activity, that they should not (as he saith) *drink* and *guzzle* the juices of the *Body*, but *sip* them only.
5. There are two kinds of *Flames*, the one eager and weak, which consumes slight substances, but hath little power over the harder; as the flame of straw, or small sticks: the other strong and constant, which converts hard and obstinate substances; as the flame of hard wood, and such like.
6. The eager flames, and yet less robust, do dry bodies, and render them exhaust and sapless; but the stronger flames do intenerate, and melt them.
7. Also in *Dissipating Medicines*, some vapour forth the thin part of the tumors, or swellings, and these harden the tumor; others potently discuss, and these soften it.
8. Also in *Purging and Absterging Medicines*, some carry away the fluid humours violently, others draw the more obstinate and viscous.
9. The *Spirits* ought to be invested, and armed with such a heat, that they may chuse rather to stir and undermine hard and obstinate matters, than to discharge and carry away the thin and prepared: for by that means the *Body* becomes green and solid.
10. The *Spirits* are so to be wrought and tempered, that they may be in substance Dense, not Rare, in heat strong, not eager; in quantity sufficient for the Offices of Life, not Redundant or Turgid; in motion appeased, not dancing or unequal.
11. That *Vapours* work powerfully upon the *Spirits*, it is manifest by Sleep, by Drunkenness, by Melancholick Passions, by Letificant Medicines, by Odours, calling the *Spirits* back again in Swoonings and Faintings.
12. The *Spirits* are condensed four ways; either by putting them to flight, or by refrigerating and cooling them, or by stroking them, or by quieting them. And first of their Condensation, by putting them to flight.
13. Whatsoever putteth to flight on all parts, driveth the *Body* into his Centre, and so Condenseth.
14. To the Condensation of the *Spirits* by flight, the most powerful and effectual is *Opium*, and next *Opiates*, and generally all *Soporiferous things*.
15. The force of *Opium* to the Condensation of the *Spirits* is exceeding strong, when as perhaps three grains thereof will in a short time so coagulate the *Spirits*, that they return no more, but are extinguished, and become immoveable.
16. *Opium*, and the like, put not the *Spirits* to flight by their coldness, for they have parts manifestly hot; but, on the contrary, cool by their putting the *Spirits* to flight.
17. The Flight of the *Spirits* by *Opium*, and *Opiate Medicines*, is best seen by applying the same outwardly; for the *Spirits* straight withdraw themselves, and will return no more, but the part is mortified, and turns to a *Gangrene*.
18. *Opiates* in grievous pains, as in the Stone, or the cutting off of a Limb, mitigate pains most of all, by putting the *Spirits* to flight.
19. *Opiates* obtain a good effect from a bad cause; for the Flight of the *Spirits* is evil, but the Condensation of them through their flight is good.

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The *Grecians* attributed much, both for health, and for prolongation of life, as *Opiates*, but the *Arabians* much more, insomuch that their *grand Medicines* (which they called the *gods Hands*) had *Opium* for their Basis and principal Ingredient, other things being mixed to abate and correct the noxious qualities thereof; such were *Treacle*, *Metbridate*, and the rest.

Whatsoever is given with good success in the curing of *Pestilential* and *Malignant Diseases*, to stop and bridle the *Spirits*, lest they grow turbulent and tumultuous, may very happily be transferred to the prolongation of life; for one thing is effectual unto both, namely, the *Condensation* of the *Spirits*: now there is nothing better for that than *Opiates*.

The *Turks* find *Opium*, even in a reasonable good quantity, harmless and comfortable, insomuch that they take it before their Battles, to excite courage: but to us, unless it be in a very small quantity, and with good Correctives, it is mortal.

Opium and *Opiates* are manifestly found to excite *Venus*; which shews them to have force to corroborate the *Spirits*.

Distilled Water out of *wild Poppy* is given with good success in Surfeits, Agues, and divers diseases; which, no doubt, is a temperate kind of *Opiate*. Neither let any man wonder at the various use of it; for that is familiar to *Opiates*, in regard that the *Spirits*, corroborated and condensed, will rise up against any disease.

The *Turks* use a kind of Herb which they call *Caphe*, which they dry and powder, and then drink in warm water; which, they say, doth not a little sharpen them, both in their Courage, and in their Wits; notwithstanding, if it be taken in a large quantity, it affects and disturbs the mind: whereby it is manifest, that it is of the same nature with *Opiates*.

There is a Root much Renowned in all the *Eastern parts*, which they call *Betel*, which the *Indians*, and others, use to carry in their mouths, and to champ it, and by that champing they are wonderfully enabled both to endure labours, and to overcome sicknesses, and to the Act of Carnal Copulation: It seems to be a kind of *Stupefactive*, because it exceedingly blacks the Teeth.

Tobacco in our age is immoderately grown into use, and it affects men with a secret kind of delight, insomuch that they who have once inured themselves unto it, can hardly afterwards leave it: and, no doubt, it hath power to lighten the body, and to shake off weariness, Now the vertue of it is commonly thought to be, because it opens the passages, and voids humours: but it may more rightly be referred to the *Condensation* of the *Spirits*; for it is a kind of *Henbane*, and manifestly troubles the Head, as *Opiates* do.

There are sometimes *Humours* ingendred in the body, which are, as it were, *Opiate* themselves; as it is in some kind of *Melancholies*, with which if a man be affected, it is a sign of very long life.

The *simple Opiates* (which are also called *Stupefactives*) are these, *Opium* it self, which is the juice of *Poppy*; both the *Poppies*, as well in the Herb as in the Seed; *Henbane*, *Mandrake*, *Hemlock*, *Tobacco*, *Night-shade*.

The compound *Opiates* are, *Treacle*, *Metbridate*, *Trisera*, *Ladanum*, *Paracelsi*, *Diaconium*, *Diascordium*, *Philonium*, *Pills of Hounds-tongue*.

From this which hath been said, certain Designations or Counsels may be deduced for the prolongation of life, according to the present intension; namely, of *condensing* the *Spirits* by *Opiates*.

Let there be therefore every year, from Adult years of Youth, an *Opiate* diet; let it be taken about the end of *May*, because the *Spirits* in the Summer are more loose and attenuated, and there are less dangers from cold humours; let it be some *Magistral Opiate*, weaker than those that are commonly in use, both in respect of a smaller quantity of *Opium*, and of a more sparing mixture of extream hot things; let it be taken in the morning betwixt sleeps. The fare for that time would be more simple and sparing than ordinary, without Wine, or Spices, or vaporous things. This Medicine to be taken only each other day, and to be continued for a fortnight. This Designation in our judgment comes home to the Intension.

Opiates also may be taken, not only by the mouth, but also by *Fumes*; but the *Fumes* must be such as may not move the expulsive Faculty too strongly, nor force down humours, but only taken in a *West*, may work upon the *Spirits* within the brain. And therefore a *Suffumigation* of *Tobacco*, *Lignum-Albes*, *Rosemary-leaves* dried,

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dried, and a little Myrrhe snuffed up in the morning at the Mouth and Nostrils, would be very good.

34. In *Grand Opiates*, such as are *Treacle*, *Metbridate*, and the rest: it would not be amiss (especially in Youth) to take rather the distilled Waters of them, than themselves in their bodies, for the vapour in distilling doth rise, but the heat of the Medicine commonly setleth. Now *distilled Waters* are good in those vertues which are conveyed by Vapours, in other things but weak.

35. There are Medicines which have a certain weak and hidden degree, and therefore safe to an *Opiate* Vertue: These send forth a slow and copious Vapour, but not malignant, as *Opiates* do; therefore they put not the Spirits to flight notwithstanding they congregate them, and somewhat thicken them.

36. Medicines, in order to *Opiates*, are principally *Saffron*, next *Folium Indum*, *Amber-greese*, *Coriander-seed* prepared, *Amomum*, *Pseuda-momum*, *Lignum-Rhodinum*, *Orange-flower water*, and much more the *Infusion* of the same *Flowers* new gathered in the Oyl of *Almonds*; *Nutmegs* pricked full of holes, and macerated in *Rose-water*.

37. As *Opiates* are to be taken very sparingly, and at certain times, as was said, so these secondaries may be taken familiarly, and in our daily diet, and they will be very effectual to prolongation of life. Certainly an *Apothecary* of *Calecute*, by the use of *Amber*, is said to have lived an hundred and sixty years; and the *Noble-men* of *Barbary*, through the use thereof, are certifi'd to be very long-liv'd, whereas the mean people are but of short life. And our *Ancestors*, who were longer-liv'd than we, did use *Saffron* much in their Cakes, Broths, and the like. And touching the first way of condensing the Spirits of *Opiates*, and the *Subordinates* thereto, thus much.

38. Now we will enquire of the second way of condensing the *Spirits* by *Cold*: For the proper work of *Cold* is *Condensation*, and it is done without any malignity, or adverse quality; and therefore it is a safer operation than by *Opiates*, though somewhat less powerful, if it be done by turns only, as *Opiates* are. But then again, because it may be used familiarly, and in our daily Diet with moderation, it is much more powerful for the prolongation of life, than by *Opiates*.

39. The *Refrigeration* of the *Spirits* is effected three ways, either by *Respiration*, or by *Vapours*, or by *Aliment*. The first is the best, but, in a sort, out of our power: the second is potent, but yet ready, and at hand: the third is weak, and somewhat about.

40. Air clear and pure, and which hath no fogginess in it before it be received into the Lungs, and which is least exposed to the Sun-beams, condenseth the *Spirits* best. Such is found either on the tops of dry Mountains, or in *Champagnes* open to the wind, and yet not without some shade.

41. As for the *Refrigeration* and *Condensation* of the *Spirits* by *Vapours*, the Root of this Operation we place in *Nitre*, as a Creature purposely made and chosen for this end, being thereunto led, and perswaded by these Arguments.

42. *Nitre* is a kind of cool Spice: this is apparent to the Sense it self, for it bites the Tongue and Palate with cold, as Spices do with heat, and it is the only thing, as far as we know, that hath this property.

43. Almost all cold things (which are cold properly, and not by accident, as *Opium* is) are poor and jejune of spirit: Contrarily, things full of Spirit are almost all hot, only *Nitre* is found amongst Vegetables, which aboundeth with Spirit, and yet is cold. As for *Campfire*, which is full of spirit, and yet performeth the actions of cold, it cooleth by accident only; as namely, for that by the thinness thereof, without Acrimony, it helpeth perspiration in inflammations.

44. In congelating and freezing of Liquors, (which is lately grown into use) by laying Snow and Ice on the out side of the Vessel, *Nitre* is also added, and no doubt it exciteth and fortifieth the *Congelation*. It is true, that they use also for this work ordinary Bay-salt, which doth rather give activity to the coldness of the Snow, than cool by it self: But, as I have heard, in the hotter Regions, where Snow falls not, the congelating is wrought by *Nitre* alone; but this I cannot certainly affirm.

45. It is affirmed that *Gun-powder*, which consisteth principally of *Nitre*, being taken in drink, doth conduce to valour; and that it is used oftentimes by Mariners and Soldiers before they begin their Battles, as the *Turks* do *Opium*.

Nitre is given with good success in burning Agues, and Pestilential Fevers, to mitigate and bridle their pernicious heats.

It is manifest, that Nitre in Gun-powder doth mightily abhor the Flame, from whence is caused that horrible Crack, and puffing.

Nitre is found to be, as it were, the Spirit of the Earth: for this is most certain, that any Earth, though pure and unmixed with Nitrous matter, if it be so laid up and covered, that it be free from the Sun beams, and putteth forth no Vegetable, will gather Nitre, even in good abundance. By which it is clear, that the Spirit of Nitre is not only inferiour to the Spirit of living Creatures, but also to the Spirit of Vegetables.

Cattle which drink of Nitrous water, do manifestly grow fat; which is a sign of the cold in Nitre.

The manuring of the Soil is chiefly by Nitrous substances; for all Dung is Nitrous, and this is a sign of the Spirit in Nitre.

From hence it appears, that the Spirits of Man may be cooled and condensed by the Spirit of Nitre, and be made more crude, and less eager. And therefore, as strong Wines, and Spices, and the like, do burn the Spirits, and shorten life; so on the contrary side, Nitre doth compose and repress them, and furthereth to life.

Nitre may be used with meat, mixed with our Salt, to the tenth part of the Salt; in Broths taken in the morning, for three grains to ten, also in Beer: but howsoever it be used, with moderation, it is of prime force to long life.

As Opium holds the preheminance in condensing the Spirits, by putting them to flight, and hath withal his Subordinates less Potent, but more safe, which may be taken both in greater quantity, and in more frequent use, of which we have formerly spoken: So also Nitre, which condenseth the Spirits by cold, and by a kind of Frescour (as we now-a-days speak) hath also his Subordinates.

Subordinates to Nitre are, all those things which yield an Odour somewhat Earthy, like the smell of Earth, pure and good, newly digged or turned up; of this sort the chief are, Borage, Bugloss, Langue de Bœuf, Barnet, Strawberry-leaves, and Strawberries, Frambois, or Raspis, raw Cucumbers, raw Pearmain, Vine-leaves, and Buds: also Violets.

The next in order, are those which have a certain freshness of smell, but somewhat more inclined to heat, yet not altogether void of that vertue of refreshing by coolness; such as are Balm, green Citrons, green Oranges, Rose-water distilled, roasted Wardens; also the Damask, Red, and Musk Roses.

This is to be noted, that Subordinates to Nitre do commonly confer more to this Intension Raw, than having passed the Fire, because that the Spirit of Cooling is dissipated by the Fire, therefore they are best taken, either infused in some liquor, or raw.

As the condensation of the Spirits by Subordinates to Opium is, in some sort, performed by Odours, so also that which is by Subordinates to Nitre: therefore the smell of new and pure Earth, taken either by following the Plough, or by Digging, or by Weeding, excellently refresheth the Spirits. Also the Leaves of Trees in Woods, or Hedges, falling towards the middle of Autumn, yield a good refreshing to the Spirits, but none so good as Strawberry-leaves dying. Likewise the smell of Violets, or Wall flowers, or Bean-flowers, or Sweet-briar, or Honey-suckles, taken as they grow, in passing by them only, is of the same nature.

Nay, and we know a certain great Lord who lived long, that had every morning immediately after sleep, a Clod of fresh Earth laid in a fair Napkin under his Nose, that he might take the smell thereof.

There is no doubt but the cooling and tempering of the blood by cool things, such as are Endive, Succory, Lever-wort, Purslain, and the like, do also by consequent cool the Spirits: But this is about, whereas vapours cool immediately.

And as touching the condensing of the Spirits by Cold, thus much: The third way of condensing the Spirits, we said to be by that which we call stroaking the Spirits: The fourth, by quieting the alacrity and unruliness of them.

Such things stroak the Spirits as are pleasing and friendly to them, yet they allure them not to go abroad; but rather prevail, that the Spirits contented, as it were,

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in their own society, do enjoy themselves, and betake themselves into their proper Centre.

61. For these, if you recollect those things which were formerly set down, as Subordinates to Opium and Nitre, there will need no other *Inquisition*.

62. As for the quieting of the unruliness of the Spirits, we shall presently speak of that, when we enquire touching their motion. Now then, seeing we have spoken of that Condensation of the Spirits which pertaineth to their substance, we will come to the temper of Heat in them.

63. The heat of the Spirits, as we said, ought to be of that kind, that it may be robust, not eager, and may delight rather to Master the tough and obstinate, than to carry away the thin and light humours.

64. We must beware of Spices, Wine, and strong Drinks, that our use of them be very temperate, and sometimes discontinued: Also of Savory, wild Marjoram, Penny-royal, and all such as bite and heat the tongue; for they yield unto the Spirits an heat not operative, but predatory.

65. These yield a robust heat, especially Elecampane, Garlic, Carduus Benedictus, Water-cresses, while they are young, Germander, Angelica, Zedoary, Vervain, Valerian, Myrrhe, Pepper wort, Elder-flowers, Garden-Chervile. The use of these things with choice and judgement, sometimes in Sallads, sometimes in Medicines, will satistie this Operation.

66. It falls out well, that the Grand Opiates will also serve excellently for this Operation, in respect that they yield such an heat by Composition, which is wished, but not to be found in Simples. For the mixing of those excessive hot things (such as are Euphorbium, Pellitory of Spain, Stavis-acre, Dragon-wort, Anacardi, Castoreum, Aristolochium, Opipenax, Ammoniachum, Galbanum, and the like, which of themselves cannot be taken inwardly) to qualifie and abate the stupefactive virtue of the Opium, they do make such a Constitution of a Medicament as we now require, which is excellently seen in this, that Treacle and Mithridate, and the rest, are not sharp, nor bite the tongue, but are only somewhat bitter, and of strong scent, and at last manifest their heat when they come into the stomach, and in their subsequent operations.

67. There conduces also to the robust heat of the Spirits Venus often excited, rarely performed; and no less some of the Affections, of which shall be spoken hereafter. So touching the heat of the Spirits, Analogical to the prolongation of life, thus much.

68. Touching the Quantity of the Spirits, that they be not exuberant and boiling, but rather sparing, and within a mean, (seeing a small flame doth not devour so much as a great flame) the *Inquisition* will be short.

69. It seems to be approved by Experience, that a spare Diet, and almost a Pythagorical, such as is either prescribed by the strict Rules of a Monastical life, or practised by Hermites, which have Necessity and Poverty for their Rule, rendreth a man long-lived.

70. Hitherto appertain drinking of Water, a hard Bed, abstinence from Fire, a slender Diet, (as namely, of Herbs, Fruits, Flesh, and Fish, rather powdered and salted, than fresh and hot) an Hair-shirt, frequent Fastings, frequent Watchings, few Sensual pleasures, and such like; for all these diminish the Spirits, and reduce them to such a quantity, as may be sufficient only for the Functions of Life, whereby the depredation is the less.

71. But if the Diet shall not be altogether so rigorous and mortifying, yet notwithstanding shall be always equal and constant to it self, it worketh the same effect. We see it in Flames, that a Flame somewhat bigger (so it be always alike and quiet) consumeth less of the fuel, than a lesser Flame blown with Bellows, and by Gusts strengthened plainly: That which the Regiment and Diet of Cornarus the Venetian shewed plainly, who did eat and drink so many years together by a just weight, whereby he exceeded an hundred years of age; strong in limbs, and entire in his senses.

72. Care also must be taken, that a body, plentifully nourished, and not emaciated by any of these aforesaid Diets, omitteth not a seasonable use of Venus; lest the Spirits increase too fast, and soften and destroy the body. So then, touching a moderate quantity of Spirits, and (as we may say) Frugal, thus much.

73. The *Inquisition*, touching bridling the motions of the Spirits, followeth next.

Motion

Motion doth manifestly attenuate and inflame them. This bridling is done by three means : by Sleep, by avoiding of vehement Labours, immoderate exercise, and in a word, all Lassitude, and by refraining irksome Affections. And first, touching Sleep.

The Fable tells us, that Epimenides slept many years together in a Cave, and all that time needed no meat, because the Spirit wast not much in sleep.

Experience teacheth us that certain Creatures, as Dormice and Bats sleep in some close places an whole Winter together; such is the force of sleep to restrain all vital Consumption. That which Bees and Drones are also thought to do, though sometimes destitute of Honey, and likewise Butter-flies, and other Flies.

Sleep after Dinner (the stomach sending up no unpleasing Vapours to the head, as being the first Dew of our Meat) is good for the spirits, but derogatory and hurtful to all other points of health. Notwithstanding in extream old age there is the same reason of Meat and Sleep, for both our meals and our sleeps should be then frequent, but short and little; nay, and towards the last period of old age, a mere Rest, and, as it were, a perpetual Reposing doth best, especially in Winter-time.

But as moderate sleep conferreth to long life, so much more if it be quiet and not disturbed.

These procure quiet sleep, Violets, Lettuce, especially boiled, Sirrup of dried Roses, Saffron, Balm, Apples, at our going to bed; a sop of Bread in Malmsiey, especially where Musk-Roses have been first infused: therefore it would not be amiss to make some Pill or a small Draught of these things, and to use it familiarly. Also those things which shut the mouth of the stomach close, as Coriander-seed prepared, Quinces and Wardens roasted, do induce sound sleep; but above all things in youth, and for those that have sufficient strong stomachs, it will be best to take a good draught of clear cold Water when they go to bed.

Touching voluntary and procured Trances, as also fixed and profound Thoughts, so as they be without irksomness, I have nothing certain: no doubt they make to this Intension, and condense the Spirits, and that more potently than Sleep, seeing they lay a sleep, and suspend the senses as much or more. Touching them, let further inquiry be made. So far touching Sleep.

As for Motion and Exercise, Lassitude hurteth, and so doth all Motion and Exercise which is too nimble and swift, as Running, Tennis, fencieing, and the like: and again, when our strength is extended and strained to the uttermost, as Dancing, Wrestling, and such like: for it is certain, that the spirits being driven into streights, either by the swiftness of the motion, or by the straining of the forces, do afterward become more eager and predatory. On the other side, Exercises which stir up a good strong motion, but not over-swift, or to our utmost strength, (such as are Leaping, Shooting, Riding, Bowling, and the like) do not hurt, but rather benefit.

We must come now to the Affections and Passions of the Mind, and see which of them are hurtful to long life, which profitable.

Great Joys attenuate and diffuse the spirits, and shorten life; familiar Cheerfulness strengthens the spirits, by calling them forth, and yet not resolving them.

Impressions of Joy in the sense are naught; ruminations of Joy in the memory, or apprehensions of them in hope or fancy, are good.

Joy suppressed, or communicated sparingly, doth more comfort the spirits than Joy poured forth and published.

Grief and sadness, if it be void of Fear, and afflict not too much, doth rather prolong life; for it contracteth the spirits, and is a kind of condensation.

Great Fears shorten the life: for though Grief and Fear do both strengthen the spirits, yet in Grief there is a simple contraction; but in Fear, by reason of the cares taken for the remedy, and hopes intermixed, there is a turmoil and vexing of the spirits.

Anger suppressed is also a kind of vexation, and causeth the spirit to feed upon the juices of the body; but let loose and breaking forth, it helpeth: as those Medicines do, which induce a robust heat.

Envy is the worst of all Passions, and feedeth upon the spirits, and they a gain upon the body, and so much the more because it is perpetual, and, as it is said, keepeth no holidays.

Pity of another's misfortune, which is not likely to befall our selves, is good:

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but *Pity*, which may reflect with some similitude upon the party pitying, is naught, because it exciteth *Fear*.

88. *Light Shame* hurteth not, seeing it contracteth the *Spirits* a little, and then straight diffuseth them: insomuch that *shamefac'd* persons commonly live long: but *shame* for some great ignominy, and which afflicteth the mind long, contracteth the *spirits* even to suffocation, and is pernicious.

89. *Love*, if it be not unfortunate, and too deeply wounding, is a kind of *Joy*, and is subject to the same *Laws* which we have set down touching *Joy*.

90. *Hope* is the most beneficial of all the *Affections*, and doth much to the prolongation of life, if it be not too often frustrated, but entertaineth the *Fancy* with an expectation of good: therefore they, which fix and propound to themselves some end, as the mark and scope of their life, and continually and by degrees go forward in the same, are, for the most part, long liv'd; in so much that when they are come to the top of their hope, and can go no higher therein, they commonly droop, and live not long after: So that *Hope* is a *Leaf-joy*, which may be beaten out to a great extension, like *Gold*.

91. *Admiration* and *light contemplation* are very powerful to the prolonging of life; for they hold the *spirits* in such things as delight them, and suffer them not to tumultuate, or to carry themselves unquietly and waywardly. And therefore all the *contemplators* of *Natural things*, which had so many, and eminent Objects to admire, (as *Democritus*, *Plato*, *Parmedides*, *Apollonius*) were long-liv'd: also *Rhetoricians*, which tasted but lightly of things, and studied rather Exornation of speech than profundity of matters, were also long lived; as *Gorgias*, *Protagoras*, *Isocrates*, *Seneca*. And certainly, as old men are for the most part talkative, so talkative men do often grow very old; for it shews a *light contemplation*, and such as do not much stain the *spirits*, or vex them: but subtil, and acute, and eager inquisition shortens life; for it tireth the *spirits*, and wasteth it.

And as touching the motion of the *Spirits*, by the *Affections* of the *Mind*, thus much. Now we will add certain other general *Observations* touching the *Spirits*, beside the former, which fall not into the precedent distribution.

92. Especial care must be taken that the *Spirits* be not too often resolved; for attenuation goeth before resolution, and the *spirit* once attenuated doth not very easily retire, or is condensed. Now *Resolution* is caused by over-great labours, over vehement affections of the mind, over great sweats, over great evacuation, hot Baths, and an untemperate and unseasonable use of *Venus*; also by over great cares and carpings; and anxious expectations; lastly, by malignant diseases, and intolerable pains and torments of the body: all which, as much as may be, (which our vulgar *Physicians* also advise) must be avoided.

93. The *spirits* are delighted both with *wonted* things, and with *new*. Now it maketh wonderfully to the conservation of the *spirits* in vigour, that we neither use *wonted* things to a satiety and glutting; nor *new* things, before a quick and strong appetite. And therefore both *customs* are to be broken off with judgment and care, before they breed a fulness; and the *appetite* after *new* things to be restrained for a time until it grow more sharp and jocond: and moreover, the *life*, as much as may be, so to be ordered, that it may have many *renovations*, and the *spirits*, by perpetual conversing in the same actions, may not wax dull. For though it were no ill saying of *Seneca's* *The fool doth ever begin to live*; yet this folly, and many more such, are good for long life.

94. It is to be observed touching the *spirits*, (though the contrary used to be done) That when men perceive their *spirits* to be in good, placid, and healthful state, (that which will be seen by the tranquillity of their *Mind*, and chearful disposition) that they cherish them, and not change them: but when, in a turbulent and untoward state, (which will also appear by their sadness, lumpishness, and other indisposition of their mind) that then they straight overwhelm them, and alter them. Now the *spirits* are contained in the same state, by a restraining of the affections, temperateness of diet, abstinence from *Venus*, moderation in labour, indifferent rest and repose: and the contrary to these do alter and overwhelm the *spirits*; as namely, vehement affections, profuse feasting, immoderate *Venus*, difficult labours, earnest studies, and prosecution of business. Yet men are wont, when they are merriest and best disposed, then to apply themselves to feasting,

Venus

Venus, Labours, Endeavours, Buſineſſes, whereas if they have a regard to long life, (which may ſeem ſtrange) they ſhould rather praſtiſe the contrary. For we ought to cheriſh and preſerve good *Spirits*, and for the evil diſpoſed *Spirits* to diſcharge and alter them.

Ficinus ſaith not unwiſely, That old men, for the comforting of their ſpirits, ought often to remember and ruminare upon the *Acts* of their *Childhood* and *Youth*. Certainly ſuch a remembrance is a kind of peculiar Recreation to every old man: and therefore it is a delight to men to enjoy the ſociety of them which have been brought up together with them, and to viſit the places of their education. *Veſpaſian* did attribute ſo much to this matter, that when he was *Emperour*, he would by no means be perſwaded to leave his Fathers houſe, though but mean, left he ſhould loſe the wonted object of his eyes, and the memory of his *Childhood*: And beſides, he would drink in a *wooden Cup* tipped with ſilver, which was his *Grandmothers*, upon *Festival days*.

One thing above all is grateful to the *Spirits*, that there be a continual progreſs to the more *benign*; therefore we ſhould lead ſuch a *Youth* and *Manhood*, that our Old Age ſhould find new ſolaces, whereof the chief is *moderate eaſe*: And therefore old men in Honourable Places lay violent hands upon themſelves, who retire not to their eaſe: whereof may be found an eminent example in *Caffiodorus*, who was of that reputation amongſt the *Gothiſh Kings* of *Italy*, that he was as the Soul of their Affairs: Afterwards, being near eighty years of age, he betook himſelf to a Monaftery, where he ended not his days before he was an hundred years old. But this thing doth require two Cautions: one, that they drive not off till their bodies be utterly worn out, and diſeaſed; for in ſuch bodies all mutation, though to the more *benign*, haſteneth death: the other, that they ſurrender not themſelves to a *ſluggiſh eaſe*, but that they embrace ſomething which may entertain their thoughts and mind with Contentation; in which kind, the chief delights are Reading and Contemplation; and then the deſires of Building and Planting.

Laſtly, The ſame *Action*, *Endeavour* and *Labour* undertaken chearfully, and with a good will, doth reſreſh the *Spirits*; but with an *averſation* and *unwillingneſs*, doth fret and deſect them. And therefore it conſerreth to long life, either that a man hath the art to inſtitute his life ſo as it may be free and ſuitable to his own humour, or elſe to lay ſuch a command upon his mind, that whatſoever is impoſed by Fortune, it may rather lead him, than drag him.

Neither is that to be omitted towards the government of the *Affections*, that eſpecial care be taken of the *mouth* of the *Stomach*, eſpecially that it be not too much relaxed; for that part hath a greater dominion over the *affections*, eſpecially the daily *affections*, than either the Heart or Brain; only thoſe things excepted which are wrought by potent vapours, as in Drunkenneſs and Melancholly.

Touching the Operation upon the *Spirits*, that they may remain youthful, and renew their vigour, thus much: which we have done more accurately, for that there is, for the moſt part, amongſt *Phyſicians*, and other Authors, touching theſe Operations, a deep ſilence; but eſpecially, becauſe the Operation upon the *Spirits*, and their waxing green again, is the moſt ready and compendious way to long life; and that for a twofold compendiouſneſs: one, becauſe the *Spirits* work compendiouſly upon the body: the other, becauſe *Vapours*, and the *Affections*, work compendiouſly upon the *Spirits*; ſo as theſe attain the end, as it were, in a right line, other things rather in lines circular,

The Operation upon the Excluſion of the Air. 2.

The History.

THE Excluſion of the Air Ambient, tendeth to length of life two ways: Firſt, for that the External Air, next unto the Native *Spirits*, (howſoever the Air may be ſaid to animate the Spirit of Man, and conſerreth not a little to health) doth moſt of all prey upon the Juices of the body,

and hasten the Desiccation thereof; and therefore the Exclusion of it is effectual to length of life.

2. Another effect which followeth the Exclusion of Air, is much more subtil and profound; namely, that the Body closed up, and not perspiring by the pores, detaineth the Spirits within, and turneth it upon the harder parts of the body, whereby the Spirit mollifies and intenerates them.

3. Of this thing, the reason is explained in the Desiccation of Inanimate Bodies; and it is an Axiom almost infallible, that the Spirit discharged and issuing forth, drieth Bodies; detaineth, melteth and intenerateth them. And it is further to be assumed, that all Heat doth properly attenuate and moisten, and contracteth and drieth only by accident.

4. Leading the life in Dens and Caves, where the Air receives not the Sun-beams, may be effectual to long life. For the Air of it self doth not much towards the depredation of the body, unless it be stirred up by heat. Certainly, if a man shall recal things past to his memory, it will appear that the statues of men have been anciently much greater than those that succeeded, as in Sicily, and some other places: but this kind of men led their lives, for the most part, in Caves. Now length of life, and largeness of limbs, have some affinity: The Cave also of Epimenides walks among the Fables. I suppose likewise, that the life of Columnar Anchorites was a thing resembling the life in Caves, in respect the Sun-beams could not much pierce thither, nor the Air receive any great changes or inequalities. This is certain, both the Simeon Stelita's, as well Daniel as Saba, and other Columnar Anchorites; have been exceeding long-liv'd. Likewise the Anchorites in our days, closed up and immured either within Walls or Pillars, are often found to be long-liv'd.

5. Next unto the life in Caves, is the life on Mountains: for as the beams of the Sun do not penetrate into Caves; so on the tops of Mountains, being destitute of Reflexion, they are of small force. But this is to be understood of Mountains where the Air is clear and pure; namely, whether by reason of the driness of the Valleys, Clouds and Vapours do not ascend: as it is in the Mountains which encompass Barbary, where, even at this day, they live many times to an hundred and fifty years, as hath been noted before.

6. And this kind of Air of Caves and Mountains, of its own proper nature, is little or nothing predatory; but Air, such as ours is, which is predatory through the heat of the Sun, ought as much as is possible, to be excluded from the body.

7. But the Air is prohibited and excluded two ways: First, by closing the Pores: Secondly, by filling them up.

8. To the closing of the Pores, help coldness of the Air, going naked, whereby the skin is made hard, washing in cold water, Astringents applied to the skin, such as are Mastick, Myrrhe, Myrtle.

9. But much more may we satisfy this Operation by Baths, yet those rarely used, (especially in Summer) which are made of Astringent mineral waters, such as may safely be used, as Waters participating of Steel and Coperas; for these do potently contract the skin.

10. As for filling up the Pores, Paintings, and such like Unctuous daubings, and (which may most commodiously be used) Oyl and fat things, do no less conserve the substance of the body, than Oyl-colours and Varnish do preserve Wood.

11. The ancient Britains painted their bodies with Woad, and were exceeding long-liv'd: The Pers also used Paintings, and are thought by some to have derived their name from thence.

12. The Brasilians and Virginians paint themselves at this day, who are (especially the former) very long-liv'd; inasmuch that five years ago the French Jesuites had speech with some who remembered the building of Fernambuck, which was done an hundred and twenty years since; and they were then at Man's estate.

13. Joannes de temporibus, who is reported to have extended his life to three hundred years, being asked how he preserved himself so long, is said to have answered, By Oyl without, and by Honey within.

14. The Irish, especially the Wild-Irish, even at this day live very long: certainly they report, that within these few years the Countess of Desmond lived to an hundred and forty years of age, and bred Teeth three times. Now the Irish have a fashion to chafe, and, as it were, to baste themselves with old Salt-butter against the fire.

The same *Irish* use to wear *Saffroned Linnen* and *Shirts*: which though it were at first devised to prevent Vermin, yet howsoever I take it to be very useful for lengthning of life: for *Saffron*, of all things that I know, is the best thing for the skin, and the comforting of the flesh; seeing it is both notably Astringent, and hath besides an Oleosity and subtil heat, without any Acrimony. I remember a certain *English-man*, who when he went to Sea, carried a bag of *Saffron* next his stomach, that he might conceal it; and so escape Custom: And whereas he was wont to be always exceeding Sea-sick, at that time he continued very well, and felt no provocation to vomit.

Hippocrates adviseth in Winter to wear clean Linnen, and in Summer foul Linnen, and besmeared with Oyl: The reason may seem to be, because in Summer the *Spirits* exhale most; therefore the pores of the skin would be filled up.

Hereupon we are of opinion, that the use of Oyl, either of *Olives* or *Sweet Almonds*, to anoint the skin therewith, would principally conduce to long life: The anointing would be done every morning, when we rise out of bed, with Oyl, in which a little *Bay-salt* and *Saffron* is mixed. But this anointing must be lightly done with Wooll, or some soft Sponge, not laying it on thick, but gently touching and wetting the skin.

It is certain, that *Liquors*, even the Oily themselves, in great quantities draw somewhat from the body: but contrarily, in small quantities are drunk in by the body: therefore the anointing would be but light, as we said, or rather the shirt it self, would be besmeared with Oyl.

It may happily be objected, that this anointing with Oyl which we commend, (though it were never in use with us, and amongst the *Italians* is cast off again) was anciently very familiar amongst the *Grecians* and *Romans*, and a part of their Diet; and yet men were not longer-liv'd in those days than now. But it may rightly be answered, Oyl was in use only after Baths, unless it were perhaps amongst *Champions*: Now hot Baths are as much contrary to our Operation, as Anointings are congruous, seeing the one opens the Passages, the other stops them up: therefore the Bath, without the anointing following, is utterly bad; the anointing, without the Bath, is best of all. Besides, the anointing amongst them was used only for delicacy, or (if you take it at the best) for health, but by no means in order to long life; and therefore they used them with all precious Oyntments, which were good for deliciousness, but hurtful to our intention, in regard of their heat: So that *Virgil* seemeth not to have said amiss,

—Nec Casia liquidi corrumpitur usus Olivi,

That odoriferous Casia hath not supplanted the use of neat Oyl-Olive.

Anointing with Oyl conduceth to health, both in Winter, by the exclusion of the cold Air, and in Summer, by detaining the Spirits within, and prohibiting the resolution of them, and keeping off the force of the Air which is then most predatory.

Seeing the anointing with Oyl is one of the most potent Operations to long life, we have thought good to add some cautions, lest the health should be endangered: They are four, according to the four Inconveniences which may follow thereupon.

The first Inconvenience is, that by repressing sweats, it may ingender diseases from those excrementitious humours. To this a remedy must be given by Purges and Clysters, that evacuation may be duly performed. This is certain, that evacuation by sweats commonly advanceth health, and derogateth from long life; but gentle Purges work upon the humours, not upon the spirits, as sweat doth.

The second Inconvenience is, that it may heat the body, and in time inflame it; for the spirits shut in, and not breathing forth, acquire heat. This inconvenience may be prevented, if the Diet most usually incline to the colder part, and that at times some proper cooling Medicines be taken, of which we shall straight speak in the operation upon the Blood.

The third is, that it may annoy the head; for all Oppletion from without strikes back the vapours, and sends them up unto the head. This inconvenience is remedied by Purgers, especially Clysters, and by shutting the mouth of the stomach strongly with Stipticks, and by combing and rubbing the head, and by washing it with convenient Lees, that something may exhale, and by not omitting competent and good exercises, that something also may perspire by the skin.

25.

The fourth *Inconvenience* is a more subtil Evil; namely, that the Spirit being detain'd by the closing up of the Pores, is likely to multiply it self too much: for when little issueth forth, and new Spirit is continually ingendred, the Spirit increaseth too fast, and so preyeth upon the body more plentifully. But this is not altogether so; for all Spirit closed up is dull, (for it is blown and excited with motion as Flame is) and therefore it is less active, and less generative of it self: Indeed it is thereby increased in heat, (as Flame is) but slow in motion. And therefore the remedy to this inconvenience must be by cold things, being sometimes mixed with *Oyl*, such as are *Roses* and *Myrtles*, for we must altogether disclaim hot things, as we said of *Cassia*.

26.

Neither will it be unprofitable to wear next the body Garments that have in them some *Unctuousity*, or *Oleosity*, not *Aquosity*, for they will exhaust the body less, such as are those of Woollen, rather than those of Linnen. Certainly it is manifest in the Spirits of Odours, that if you lay sweet Powders amongst Linnen, they will much sooner lose their smell, than amongst Woollen. And therefore Linnen is to be preferred for delicacy and neatness, but to be suspected for our *Operation*.

27.

The *Wild Irish*, as soon as they fall sick, the first thing they do is to take the Sheets off their Beds, and to wrap themselves in the Woollen Cloaths.

28.

Some report, that they have found great benefit in the conservation of their health, by wearing *Scarlet Wastables* next their skin, and under their shifts, as well down to the neather parts, as on the upper.

29.

It is also to be observed, that *Air* accustomed to the body doth less prey upon it, than new *Air*, and often changed: and therefore poor people in small Cottages, who live always within the smell of the same Chimney, and change not their Seats, are commonly longest-lived: Notwithstanding, to other operations (especially for them whose Spirits are not altogether dull) we judge change of *Air* to be very profitable, but a mean must be used, which may satiate on both sides. This may be done by removing our habitation four times a year, at constant and set times, unto convenient Seats, that so the body may neither be in too much Peregrination, nor in too much Station. And touching the *Operation* upon the *Exclusion* of *Air*, and avoiding the *Predatory* force thereof, thus much.

The Operation upon the Bloud, and the Sanguifying Heat. 3.

The History.

1.

THE following *Operations* answer to the two precedent, and are in the relation of *Passives* and *Actives*: For the two precedent intend this, that the *Spirits* and *Air* in their actions may be the less depredatory, and the two latter, that the *Bloud* and *Juice* of the Body may be the less depredable. But because the *Bloud* is an irrigation or watering of the Juices and Members, and a preparation to them, therefore we will put the *Operation* upon the *Bloud*, in the first place: Concerning this *Operation*, we will propound certain Counsels, few in number, but very powerful in virtue. They are three.

2.

First, There is no doubt, but that if the *Bloud* be brought to a cold temper, it will be so much the less dissipable. But because the cold things which are taken by the mouth agree but ill with many other Intentions, therefore it will be best to find out some such things as may be free from these inconveniences. They are two.

3.

The first is this: Let there be brought into use, especially in Youth, *Clysters* not purging at all, or absterging, but only cooling, and somewhat opening: Those are approved which are made of the Juices of *Lettuce*, *Purslane*, *Liver-wort*, *Houfseek*, and the *Mucilage* of the seed of *Flea-wort*, with some temperate opening decoction, and a little

little *Campfire* : but in the declining age let the *Horsleek* and *Purslane* be left out, and the juices of *Borage* and *Endive*, and the like be put in their rooms. And let these *Clysters* be retained, if it may be, for an hour or more.

The other is this, Let there be in use, especially in Summer, *Baths* of fresh water, and but luke-warm, altogether without *Emollients*, as *Mallows*, *Mercury*, *Milk*, and the like; rather take new *whey* in some good quantity, and *Roses*.

But (that which is the principal in this intention, and new) we advise that before the bathing, the body be anointed with Oil, with some *thicknes*, whereby the quality of the cooling may be received, and the water excluded : yet let not the pores of the body be shut too close; for when the outward cold closeth up the body too strongly, it is so far from furthering coolness, that it rather forbids, and stirs up heat.

Like unto this is the use of *Bladders*, with some decoctions and cooling juices, applied to the inferiour region of the body, namely, from the ribs to the privy parts; for this also is a kind of *bathing*, where the body of the liquor is for the most part excluded, and the cooling quality admitted.

The third counsel remaineth, which belongeth not to the quality of the *blood*, but to the substance thereof, that it may be made more firm and less dissipable, and such as the heat of the spirit may have the less power over it.

And as for the use of *Filings* of *Gold*, *Leaf-gold*, *Powder* of *Pearl*, *Precious stones*, *Coral*, and the like, we have no opinion of them at this day, unless it be onely as they may satisfy this present *Operation*. Certainly, seeing the *Arabians*, *Grecians* and *modern Physicians*, have attributed such vertues to these things, it cannot be altogether Nothing which so great men have observed of them. And therefore omitting all fantastical opinions about them we do verily believe, that if there could be some such things conveyed into the whole mass of the blood in minute and fine portions, over which the spirits and heat should have little or no power, absolutely it would not only resist *Putrefaction*, but *Arefaction* also, and be a most effectual means to the prolongation of life. Nevertheless in this thing several cautions are to be given. First, that there be a most exact comminution. Secondly, that such hard and solid things be void of all malignant qualities, lest while they be dispersed and lurk in the veins, they breed some ill convenience. Thirdly, that they be never taken together with meats, nor in any such manner as they may stick long, lest they beget dangerous obstructions about the *Mesentery*. Lastly, that they be taken very rarely, that they may not congregate and knot together in the veins.

Therefore let the manner of taking them be *fasting*, in *white wine*, a little *Oil* of *Almonds* mingled therewith, *Exercise* used immediately upon the taking of them.

The *Simples* which may satisfy this *Operation* are, in stead of all, *Gold*, *Pearls*, and *Coral* : for all *Metal*, except *Gold*, are not without some malignant quality in the dissolutions of them, neither will they be beaten to that exquisite fineness that *Leaf-gold* hath. As for all *glassie* and *transparent Jewels*, we like them not, (as we said before) for fear of *Corrosion*.

But, in our judgment, the safer and more effectual way would be by the use of *Woods* in *Infusions* and *Decoctions*; for there is in them sufficient to cause firmness of *blood*, and not the like danger for breeding obstructions; but especially, because they may be taken in meat and drink, whereby they will find the more easie entrance into the veins, and not be avoided in excrements.

The *Woods* fit for this purpose are *Sanders*, the *Oak* and *Vine*. As for all *hot woods* or something *Rosennie*, we reject them : notwithstanding you may add the *woody stalks* of *Rosemary* dried, for *Rosemary* is a *Shrub*, and exceedeth in age many *Trees*, also the *woody stalks* of *Ivy*, but in such quantity as they may not yield an unpleasing taste.

Let the *Woods* be taken either boiled in *Broths*, or infused in *Must* or *Ale* before they leave working; but in *Broths* (as the custome is for *Guaiacum* and the like) they would be infused a good while before the boiling, that the firmer part of the *wood*, and not that onely which lieth loosely, may be drawn forth. As for *Ash*, though it be used for *Cups*, yet we like it not. And touching the *Operation* upon the *Blood* thus much.

The Operation upon the Juices of the Body. 4.

The History.

1. **T**Here are two kinds of *Bodies* (as was said before in the *Inquisition* touching *In-*
animates) which are hardly consumed, *Hard* things and *Fat* things; as is
seen in *Metals* and *Stones*, and in *Oil* and *Wax*.
2. It must be ordered therefore, that the *juice* of the *body* be somewhat *hard*, and that
it be *fat* or *subrosid*.
3. As for *hardness*, it is caused three ways: by *Aliment* of a *firm* nature, by *cold* con-
dening the *skin* and *flesh*, and by *Exercise*, binding and compacting the *juices* of the
body, that they be not soft and frothy.
4. As for the *Nature* of the *Aliment*, it ought to be such as is not easily *dissipable*, such
as are *Beef*, *Swine's flesh*, *Dear*, *Goat*, *Kid*, *Swan*, *Goose*, *Ring-dove*, especially if they be a
little powdred; *Fish* likewise salted and dried, *Old Cheese* and the like.
5. As for the *Bread*, *Oaten-Bread* or bread with some mixture of *Pease*, in it, or *Rye-*
bread, or *barly-bread*, are more solid than *Wheat bread*, and in *Wheat-bread*, the
course *Wheat-bread* is more solid than the pure *Manchet*.
6. The *Inhabitants* of the *Orcades*, which live upon salted *fish*, and generally all *Fish-eaters*,
are long liv'd.
7. The *Monks* and *Hermites* which fed sparingly, and upon dry *Aliment*, attained com-
monly to a great age.
8. Also pure *Water* usually drunk makes the *juices* of the *body* less frothy: unto which
if, for the dulness of the *spirits*, (which no doubt in *Water* are but a little penetrative)
you shall adde a little *Nitre*, we conceive it would be very good. And touching the
firmness of the *Aliment* thus much.
9. As for the *Condensation* of the *skin* and *flesh* by *cold*: They are longer liv'd for the
most part that live abroad in the *open air*, than they that live in *Houses*; and the *Inha-*
bitants of the *cold Countries*, than the *Inhabitants* of the *hot*.
10. Great store of *cloathes*, either upon the *bed* or *back*, do resolve the *body*.
11. Washing the *body* in *cold Water* is good for length of life; use of *hot Baths* is nought,
Touching *Baths* of *Astringent Mineral Waters* we have spoken before.
12. As for *Exercise*, an idle life doth manifestly make the *flesh* soft and dissipable: *robust*
exercise (so it be without over-much sweating or wearyness) maketh it hard and com-
pact. Also *exercise* within *cold Water*, as *swimming*, is very good; and generally
exercise abroad is better than that within *houses*.
13. Touching *Frications*, (which are a kind of *exercise*) because they do rather call forth
the *Aliment* that harden the *flesh*, we will inquire hereafter in the due place.
14. Having now spoken of *hardning* the *juices* of the *body*, we are to come next to the
Oleosity and *Fattiness* of them, which is a more perfect and potent *Intention* than *Indu-*
ration, because it hath no inconvenience or evil annexed. For all those things which
pertain to the *hardning* of the *juices* are of that nature, that while they prohibit the
absorption of the *aliment*, they also hinder the operation of the same; whereby it
happens, that the same things are both propitious and adverse to length of life: but those
things which pertain to making the *Juices* *Oily* and *Roscid*, help on both sides, for they
render the *Aliment* both less dissipable, and more reparable.
15. But whereas we say that the *Juice* of the *body* ought to be *Roscid* and *Fat*, it is to be
noted that we mean it not of a visible *Fat*, but of a *Dewiness* dispersed, or (if you will
call it) *Radical* in the very substance of the *body*.
16. Neither again let any man think, that *Oil*, or the *Fat* of *Meats*, or *Marrow* do engen-
der the like, and satisfie our intention: for those things which are once perfect are
not brought back again; but the *Aliments* ought to be such, which after digestion
and maturation do then in the end engender *Oleosity* in the *Juices*.
17. Neither again let any man think, that *Oil* or *Fat* by it self and simple is hard of diffi-
pation; but in mixture it doth not retain the same nature: for as *Oil* by it self is much
more longer in consuming than *Water*; so in *Paper* or *Linnen* it sticketh longer, and
is latter dried, as we noted before.

To the Irroration of the body, roasted meats or baked meats are more effectual than boiled meats, and all preparation of meat with water is inconvenient: besides, Oil is more plentifully extracted out of dried bodies than out of moist bodies.

Generally, to the Irroration of the body much use of sweet things is profitable, as of Sugar, Honey, Sweet-Almonds, Pin apples, Pistachio's, Dates, Raisins of the Sun, Corans, Figs, and the like. Contrarily, all sour, and very salt, and very biting things are opposite to the generation of Roscid Juice.

Neither would we be thought to favour the Maeniches, or their diet, though we commend the frequent use of all kinds of Seeds, Kernels, and Roots in Meats or Sauces, considering all Bread (and bread is that which maketh the Meat firm) is made either of Seeds or Roots.

But there is nothing makes so much to the Irroration of the body, as the quality of the Drink, which is the convoy of the Meat; therefore let there be in use such Drinks as without all acrimony or sowness are notwithstanding subtil: such are those Wines which are (as the old woman said in *Plautus*) *venustate dentula*, toothless with age, and Ale of the same kind.

Mead (as we suppose) would not be ill if it were strong and old: but because all Honey hath in it some sharp parts, (as appears by that sharp water which the Chymists extract out of it, which will dissolve metals) it were better to take the same portion of Sugar, not lightly infused in it, but so incorporated as honey useth to be in Mead, and to keep it to the age of a year, or at least six months, whereby the Water may lose the crudity; and the Sugar acquire subtilty.

Now ancientness in Wine or Beer hath this in it, that it ingenders subtilty in the parts of the Liquor, and acrimony in the Spirits, whereof the first is profitable, and the second hurtful. Now to rectifie this evil commixture, let there be put into the vessel, before the Wine be separated from the Mutt; Swines-flesh or Deers-flesh well boiled, that the Spirits of the Wine may have whereupon to ruminate and feed, and so lay aside their mordacity.

In like manner, if Ale should be made not only with the grains of Wheat, Barley, Oates, Pease, and the like; but also should admit a part (suppose a third part to these grains) of some fat roots, such as are Potado-roots, Pith of Artichokes, Burre-roots, or some other sweet and esculent roots; we suppose it would be a more useful drink for long life than Ale made of grains onely.

Also such things as have very thin parts, yet notwithstanding are without all acrimony or mordacity, are very good Sallets: which vertue we find to be in some few of the Flowers; namely, Flowers of Ivy, which infused in Vinegar are pleasant even to the tast; Marigold-leaves, which are used in Broths; and Flowers of Betony. And touching the operation upon the Juices of the Body thus much.

The Operation upon the Bowels of their Extrusion of Aliment. 5.

The History.

What those things are which comfort the Principal Bowels, which are the fountains of Concoctions, namely, the Stomack, Liver, Heart and Brain, to perform their functions well, (whereby Aliment is distributed into the parts, Spirits are dispersed, and the Reparation of the whole body is accomplished) may be derived from Physicians and from their Prescripts and Advices.

Touching the Spleen, Gall, Kidneys, Mesenteries, Guts and Lungs, we speak not, for these are members ministering to the principal and whereas speech is made touching health, they require sometimes a most special; consideration, because each of these have their diseases, which unless they be cured, will have influence upon the Principal Members. But as touching the prolongation of life, and reparation by aliments, and retardation of the incoction of old age; if the Concoctions and those

those principal Bowels be well disposed, the rest will commonly follow according to ones wish.

3. And as for those things which, according to the different state of every mans body, may be transferred into his Diet, and the Regiment of his life, he may collect them out of the Books of Physitians, which have written of the comforting and preserving the four principal Members: For conservation of health hath commonly need of no more than some short courses of Physick; but length of life cannot be hoped without an orderly diet, and a constant Race of *Sovereign Medicines*. But we will propound some few, and those the most select and prime directions.
4. The *Stomach* (which, as they say, is the Master of the house, and whose strength and goodness is Fundamental to the other concoctions) ought so to be guarded and confirmed, that it may be without *intemperateness* hot; next *astricted*, or *bound*, not loose: Furthermore *clean*, not furcharged with foul Humours, and yet (in regard it is nourished from it self, not from the veins) not altogether empty or hungry: Lastly, it is to be kept ever in *appetite*, because *appetite* sharpens digestion.
5. I wonder much how that same *Calidum bibere*, to drink warm drink, (which was in use amongst the Ancients) is laid down again. I knew a Physitian that was very famous, who in the beginning of Dinner and Supper, would usually eat a few spoonfuls of very warm *Broth* with much greediness, and then would presently wish that it were out again, saying, *He had no need of the Broth, but only of the warmth*.
6. I do verily conceive it good, that the first draught either of *Wine*, or *Ale*, or any other Drink, (to which a man is most accustomed) be taken at Supper warm.
7. *Wine* in which *Gold* hath been quenched, I conceive, would be very good once in a Meal; not that I believe the *Gold* conferreth any vertue thereunto, but that I know that the quenching of all Metals in any kind of liquor doth leave a most potent *Astriction*. Now I chuse *Gold*, because besides that *Astriction* which I desire, it leaveth nothing else behind it of a metalline impression.
8. I am of opinion, that the Sops of Bread dipped in *Wine*, taken at the midst of the Meal, are better than *Wine* it self, especially if there were infused into the *Wine* in which the Sops were dipped, *Rosemary* and *Citron-pill*, and that with *Sugar*, that it may not slip too fast.
9. It is certain, that the use of *Quinces* is good to strengthen the Stomach; but we take them to be better, if they be used in that which they call *Quiddeny* of *Quinces*, than in the bodies of the *Quinces* themselves, because they lie heavy in the Stomach. But those *Quiddeny*s are best taken after Meals, alone; before Meals, dipped in *Vinegar*.
10. Such things as are good for the Stomach above other Simples, are these, *Rosemary*, *Elecampane*, *Mastick*, *Wormwood*, *Sage*, *Mint*.
11. I allow Pills of *Aloes*, *Mastick* and *Saffron* Winter-time, taken before Dinner; but so, as the *Aloes* be not only oftentimes washed in *Rose-water*, but also in *Vinegar* in which *Tragacanth* hath been infused, and after that be macerated for a few hours in Oyl of sweet *Almonds* new drawn, before it be made into Pills.
12. *Wine* or *Ale* wherein *Wormwood* hath been infused, with a little *Elecampane* and yellow *Sanders*, will do well, taken at times, and that especially in Winter.
13. But in Summer, a draught of *White-wine* allayed with *Strawberry-water*, in which *Wine-powder* of *Pearls*, and of the shells of *Cra-fishes* exquisitely beaten; and (which may perhaps seem strange) a little *Chalk* have been infused, doth excellently refresh and strengthen the Stomach.
14. But generally, all *Draughts* in the morning (which are but too frequently used) of cooling things; as of Juices, *Decoctions*, *Whey*, *Barley-waters*, and the like) are to be avoided, and nothing is to be put into the Stomach fasting which is purely cold. These things are better given, if need require, either at five in the Afternoon, or else an hour after a light Breakfast.
15. Often Fastings are bad for long life; besides, all Thirst is to be avoided, and the Stomach is to be kept clean, but always moist.
16. Oyl of *Olives* new and good, in which a little *Methridate* hath been dissolved, anointed upon the Back-bone, just against the mouth of the Stomach, doth wonderfully comfort the Stomach.
17. A small Bag filled with Locks of *Scarlet-wooll* steeped in *Red-wine*, in which

Myrtle,

Myrtle, and *Citron-pill*, and a little *Saffron* have been infused, may be always worn upon the stomach. And touching those things which comfort the stomach thus much, seeing many of those things also which serve for other Operations are helpful to this.

The *Liver*, if it be preserved from *Torrefaction*, or *Desiccation*, and from *Obstruction*, it needeth no more; for that looseness of it which begets *Aquosities* is plainly a disease, but the other two, old age approaching induceth.

H. reunto appertain most especially those things which are set down in the *Operation* upon the *Bloud*: we will add a very few things more, but those selected.

Principally let there be in use the Wine of sweet *Pomegranates*; or, if that cannot be had, the juice of them newly expressed: let it be taken in the morning with a little *Sugar*, and into the Glass into which the Expression is made put a small piece of *Citron-pill* green, and three or four whole *Cloves*: let this be taken from *February*, till the end of *April*.

Bring also into use, above all other Herbs, *Water-cresses*, but young, not old: they may be used either raw in Sallets, or in Broths, or in Drinks: and after that take *Spoonwort*.

Albs, however washed or corrected, is hurtful for the *Liver*, and therefore it is never to be taken ordinarily. Contrariwise, *Rhubarb* is Sovereign for the *Liver*, so that these three Cautions be interposed. First, that it be taken before Meat, lest it dry the body too much, or leave some impressions of the *Stipicity* thereof. Secondly, that it be macerated an hour or two in Oyl of sweet *Almonds* new drawn, with *Rose-water*, before it be infused in Liquor, or given in the proper substance. Thirdly, that it be taken by turns, one while simple, another while with *Tartar*, or a little *Bay-salt*, that it carry not away the lighter parts only, and make the mass of the Humours more ob-
stinate.

I allow *Wine*, or some decoction with *Steel*, to be taken three or four times in the year, to open the more strong obstructions; yet so, that a draught of two or three spoonfuls of Oyl of sweet *Almonds* new drawn ever go before, and the motion of the Body, especially of the arms and sides, constantly follow.

Sweetened Liquors, and that with some fatness, are principally, and not a little effectual to prevent the *Arefaction*, and *Saltness*, and *Torrefaction*; and, in a word, the *Oldness* of the *Liver*, especially if they be well incorporated with age. They are made of Sweet Fruits and Roots; as namely, the Wines and Julips of *Raisins* of the *Sun* new, *Jujubas*, dried *Figs*, *Dates*, *Parsnips*, *Potatoes*, and the like, with the mixture of *Liquorish* sometimes: Also a Julip of the *Indian* grain, (which they call *Maiz*) with the mixture of some sweet things, doth much to the same end. But it is to be noted, that the intention of preserving the *Liver* in a kind of softness and fatness, is much more powerful than that other which pertains to the opening of the *Liver*, which rather tendeth to health, than to length of life, saving that that *Obstruction* which induceth *Torrefaction*, is as opposite to long life, as those other *Arefactions*.

I commend the Roots of *Succory*, *Spinage* and *Beets* cleared of their Piths, and boiled till they be tender in Water, with a third part of *White-wine*, for ordinary Sallets, to be eaten with Oyl and Vinegar: Also *Asparagus*, pith of *Artichokes*, and *Bur-roots* boiled and served in after the same manner: Also Broths in the Spring-time of *Vine-buds*, and the green blades of *Wheat*. And touching the preserving of the *Liver*, thus much.

The *Heart* receiveth benefit or harm most from the *Air* which we breath, from *Vapours*, and from the *Affections*. Now many of those things which have been formerly spoken, touching the *Spirits*, may be transferred hither; but that indigested mass of *Cordials* collected by Physicians avails little to our intention: notwithstanding, those things which are found to be good against *Poysons*, may with good judgment be given to strengthen and fortifie the *Heart*, especially if they be of that kind, that they do not so much resist the particular *Poysons*, as arm the heart and spirits against *Poyson* in general. And touching these several *Cordials*, you may repair to the *Table* already set down.

The goodness of the *Air* is better known by experience than by signs. We hold that *Air* to be best where the Country is level and plain, and that lieth open on all sides, so that the soyl be dry, and yet not barren or sandy; which puts forth

Wild Thyme, and *Eye-bright*, and a kind of *Marjoram*, and here and there stalks of *Calmint*; which is not altogether void of wood, but conveniently set with some Trees for shade, where the *Sweet-bryar-rose* smelleth something Musky, and Aromatically. If there be *Rivers*, we suppose them rather hurtful than good, unless they be very small, and clear, and gravelly.

28. It is certain, that the *morning air* is more lively and refreshing than the *evening air*, though the latter be preferr'd out of delicacy.

29. We conceive also, that the *Air stirred with a gentle wind* is more wholesome than the *Air of a serene and calm Skie*; but the best is, the *Wind blowing from the West* in the Morning, and from the *North* in the Afternoon.

30. *Odours* are especially profitable for the comforting of the *heart*, yet not so, as though a good *Odour* were the Prerogative of a good *Air*: for it is certain, that as there are some *Pestilential Airs* which smell not so ill as others that are less hurtful; so, on the contrary, there are some *Airs* most wholesome and friendly to the *spirits*, which either smell not at all, or are less pleasing and fragrant to the sense. And generally, where the *Air* is good, *Odours* should be taken but now and then; for a continual *Odour*, though never so good, is burthenome to the *spirits*.

31. We commend, above all others, (as we have touched before) *Odour of Plants growing*, and not *plucked*, taken in the open *air*: the principal of that kind are *Violets*, *Gilliflowers*, *Pinks*, *Bean flowers*, *Lime-tree blossoms*, *Vine-buds*, *Honey suckles*, *yellow Wall-flowers*, *Musk-Roses*, (for other *Roses* growing are fast of their smells) *Strawberry-leaves*, especially *dying*, *Sweet-bryar*, principally in the early Spring, *wild Mint*, *Lavender flowered*; and in the hotter Countries, *Orange tree*, *Citron-tree*, *Myrtle*, *Laurel*: Therefore to walk or sit near the breath of these *Plants*, would not be neglected.

32. For the comforting of the *Heart*, we prefer cool smells before hot smells: therefore the best perfume is, either in the morning, or about the heat of the day, to take an equal portion of *Vinegar*, *Rose water*, and *Claret-wine*, and to pour them upon a Fire-pan somewhat heated.

33. Neither let us be thought to sacrifice to our Mother the *Earth*, though we advise, that in *digging* or *ploughing* the *Earth* for health, a quantity of *Claret-wine* be poured thereon:

34. *Orange-flower-water*, pure and good, with a small portion of *Rose-water*, and *brisk Wine*, snuffed up into the *Nostrils*, or put into the *Nostrils* with a *Syringe*, after the manner of an *Errhine*, (but not too frequently) is very good.

35. But *champing* (though we have no *Betel*) or holding in the mouth only of such things as cheer the *Spirits*, (even daily done) is exceeding comfortable. Therefore for that purpose make *Grains*, or little *Cakes* of *Amber-greece*, *Musk*, *Lignum Aloes*, *Lignum Rhodium*, *Orris Powder*, and *Roses*; and let those *Grains* or *Cakes* be made up with *Rose-water* which hath passed through a little *Indian Balsam*.

36. The *Vapours* which arising from things inwardly taken, do fortifie and cherish the *heart*, ought to have these three properties, that they be *Friendly*, *Clear*, and *Cooling*; for hot *vapours* are naught, and *Wine* it self, which is thought to have only an heating *vapour*, is not altogether void of an *Opiate quality*. Now we call those *vapours* *Clear*, which have more of the *vapour* than of the *exhalation*, and which are not *smoaky*, or *fuliginous*, or *unctuous*, but *moist* and *equal*.

37. Out of that unprofitable Rabble of *Cordials*, a few ought to be taken into daily diet: instead of all, *Amber-greece*, *Saffron*, and the grain of *Kermes*, of the hotter sort; *Roots* of *Bugloss* and *Borrag*, *Citrons*, *Sweet Lemons*, and *Pearmains*, of the colder sort. Also that way which we said, both *Gold* and *Pearls* work a good effect, not only within the veins, but in their passage, and about the parts near the heart; namely, by cooling, without any malignant quality.

38. Of *Bezöar-stone* we believe well, because of many tryals: but then the manner of taking it ought to be such, as the vertue thereof may more easily be communicated to the *spirits*: Therefore we approve not the taking of it in *Broths* or *Syrups*, or in *Rose-water*, or any such like; but only in *Wine*, *Cinnamon-water*, or the like distilled water, but that weak or small, not burning or strong.

39. Of the *Affections* we have spoken before, we only add this, that every *Noble*, and *Resolute*, and (as they call it) *Heroical Desire*, strengthneth and enlargeth the powers of the *Heart*. And touching the *Heart*, thus much.

The History of Life and Death.

321

As for the *Brain*, where the *Seat* and *Court* of the *Animal spirits* is kept, those things which were inquired before touching *Opium*, and *Nitre*, and the *Subordinater* to them both; also touching the procuring of *placid sleep*, may likewise be referred hither. This also is most certain, that the *Brain* is in some sort in the custody of the *Stomach*; and therefore those things which comfort and strengthen the *Stomach*, do help the *Brain* by consent, and may no less be transferred hither. We will add a few *Observations*, three Outward, one Inward.

We would have *batting* of the *Feet* to be often used; at least once in a week; and the *Bath* to be made of *Lye* with *Bay-salt*, and a little *Sage*, *Chamomile*, *Fennel*, *Sweet-marjoram*, and *Pepper-wort*, with the leaves of *Angelica* green.

We commend also a *Fume* or *Suffumigation* every morning of dried *Rosemary*, *Bay-leaves* dried, and *Lignum-Aloes*; for all sweet *Gums* oppresses the head.

Especially care must be taken that no hot things be applied to the *Head* outwardly; such are all kind of *Spices*, the very *Nutmeg* not excepted: for those hot things, we debase them to the soles of the *Feet*, and would have them applied there only; but a light anointing of the *Head* with *Oil*, mixed with *Roses*, *Myrtle*, and a little *Salt* and *Saffron*, we much commend.

Not forgetting those things which we have before delivered touching *Opines*, *Nitre*, and the like, which so much condense the *spirits*; we think it not impertinent to that effect, that once in fourteen days *Broth* be taken in the morning with three or four grains of *Castoreum*, and a little *Angelica-seed*, and *Calamus*, which both fortify the *Brain*, and in that afore said density of the substance of the *spirits*, (so necessary to long life) add also a vivacity of motion and vigour to them.

In handling the *Comforters* of the four principal *Bowels*, we have propounded those things which are both proper and choice, and may safely and conveniently be transferred into *Diets* and *Regiment of Life*: for variety of *Medicines* is the *Daughter* of *Ignorance*; and it is not more true, that many *Diets* have caused many *Diseases*, as the *Proverb* is, than this is true, that many *Medicines* have caused few *Cures*. And touching the *Operation* upon the principal *Bowels* for their *Extrusion* of *Aliment*, thus much.

The Operation upon the Outward Parts for their Attraction of Aliment. 6.

The History.

Although a good *Concoction* performed by the *Inward Parts* be the principal towards a perfect *Alimentation*; yet the actions of the *Outward Parts* ought also to concur; that like as the *Inward Faculty* sendeth forth and extrudeth the *Aliment*, so the *Faculty* of the *Outward Parts* may call forth, and attract the same; and the more weak the *Faculty* of *Concoction* shall be, the more need is there of a concurring help of the *attractive Faculty*.

A strong attraction of the outward parts is chiefly caused by the motion of the *Body*, by which the parts being heated and comforted, do more chearfully call forth and attract the *Aliment* unto themselves.

But this is most of all to be foreseen and avoided, that the same motion and heat which calls the new juice to the members, doth not again despoil the member of that juice wherewith it had been before refreshed.

Frications used in the morning serve especially to this Intention; but this must evermore accompany them, that after the *Frication*, the part being lightly anointed with *Oyl*, lest the *Attrition* of the outward parts make them by *Perspiration* dry and juiceless.

The next is *Exercise*, (by which the parts confocate and chafe themselves) so it

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be moderate, and which (as was noted before) is not swift, nor to the utmost strength, nor unto weariness. But in *Exercise* and *Frication* there is the same reason and caution, that the body may not perspire, nor exhale too much: Therefore *Exercise* is better in the open Air, than in the House; and better in Winter, than in Summer. And again, *Exercise* is not only to be concluded with *Uction*, as *Frication* is, but in vehement *Exercises* *Uction* is to be used both in the beginning, and in the end, as it was anciently to *Champions*.

6. That *Exercise* may resolve either the spirits or the juices as little as may be, it is necessary that it be used when the stomach is not altogether empty: and therefore that it may not be used upon a full stomach, (which doth much concern health) nor yet upon an empty stomach, (which doth no less concern long life) it is best to take a breakfast in the morning, not of any Physical Drugs, or of any Liquors, or of Raisins, or of Figs, or the like; but of plain Meat and Drink; yet that very light, and in moderate quantity.

7. *Exercises* used for the irrigation of the members, ought to be equal to all the members; not (as *Socrates* said) that the Legs should move, and the Arms should rest, or on the contrary; but that all the parts may participate of the motion. And it is altogether requisite to long life, that the Body should never abide long in one posture, but that every half hour, at least, it change the posture, saving only in sleep.

8. Those things which are used to *Mortification*, may be transferred to *Vivification*: for both Hair-shirts, and Scourgings, and all vexations of the outward parts, do fortifie the Attractive force of them.

9. *Cardan* commends *Neeling*, even to let out *Melancholly*: but of this we have no experience: And besides, we have no good opinion of it, lest, through the venomous quality of the *Neule*, it may with often use breed Itches, and other diseases of the skin. And touching the *Operation* upon the *Outward Parts* for their *Attraction* of *Aliment*, thus much.

The Operation upon the Aliment it self, for the Insinuation thereof. 7.

The History.

1. **T**He vulgar reproach touching many Dishes, doth rather become a severe *Reformer*, than a *Physitian*: or howsoever it may be good for preservation of health, yet it is hurtful to length of life, by reason that a various mixture of *Aliments*, and somewhat heterogeneous, finds a passage into the veins and juices of the body more lively and chearfully, than a simple and homogeneous diet doth: besides, it is more forcible to stir up *Appetite*, which is the spur of *Digestion*: Therefore we allow both a full *Table*, and a continual changing of *Dishes*, according to the seasons of the year, or upon other occasions.

2. Also that Opinion of the *Simplicity* of *Meats* without *Sawces*, is but a simplicity of judgment; for good and well-chosen *Sawces* are the most wholesome preparation of *Meats*, and conduce both to health, and to long life.

3. It must be ordered, that with *Meats* hard of digestion be conjoynd strong *Liquors*, and *Sawces* that may penetrate and make way; but with *Meats* more easie of digestion, smaller *Liquors*, and rar *Sawces*.

4. Whereas we advised before, that the first *Draught* at *Supper* should be taken warm; now we add, that for the preparation of the stomach, a good draught of that *Liquor* (to which every man is most accustomed) be taken warm half an hour before *Meat* also, but a little spiced, to please the taste.

5. The preparation of *Meats*, and *Bread*, and *Drinks*, that they may be rightly handled, and in order to this Intention, is of exceeding great moment, howsoever it may seem a Mechanical thing, and favouring of the Kitchen and Buttery; yet it is of more consequence than those Fables of Gold, and Precious Stones, and the like.

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The moistning of the Juices of the Body by a moist preparation of the Aliment, is a childish thing; it may be somewhat available against the fervours of diseases, but it is altogether averse to Rofcid Alimentation. Therefore boiling of Meats, as concerning our Intention, is far inferiour to Roasting, and Baking, and the like.

Roasting ought to be with a quick fire, and soon dispatched; not with a dull fire, and in long time.

All solid fleshes ought to be served in, not altogether fresh, but somewhat powdered or corned; the less Salt may be spent at the Table with them, or none at all: for Salt incorporated with the Meat before, is better distributed in the body, than eaten with it at the Table.

There would be brought into use several and good *Macerations*, and *Infusions* of Meats in convenient Liquors, before the roasting of them: the like whereof are sometime in use before they Bake them, and in the Pickles of some Fishes.

But *beatings*, and as it were *scourgings*, of Flesh-meats before they be boiled, would work no small matter. We see it is confessed, that *Partridges* and *Pheasants* killed with an *Hawk*, also *Bucks* and *Stags* killed in *Hunting*, if they stand not out too long, eat better even to the taste; and some *Fishes* scourged and beaten, become more tender and wholesome: Also hard and sowre *Pears*, and some other Fruits, grow sweet with rowling them. It were good to practise some such beating and bruising of the harder kinds of Fleshes before they be brought to the Fire; and this would be one of the best preparations of all.

Bread a little leavened, and very little salted, is best, and which is baked in an Oven thoroughly heated, and not with a faint heart.

The preparation of Drinks, in order to long life, shall not exceed one Precept: And as touching *Water drinkers*, we have nothing to say; such a Diet (as we said before) may prolong life to an indifferent term, but to no eminent length: but in other Drinks that are full of spirit, (such as are *Wine*, *Ale*, *Mead*, and the like) this one thing is to be observed and pursued, as the sum of all, That the parts of the *Liquor* may be exceeding thin and subtil, and the *Spirit* exceeding mild. This is hard to be done by *Age* alone, for that makes the parts a little more subtil, but the spirits much more sharp and eager: therefore of the *Infusions* in the Vessels of some fat substance, which may restrain the Acrimony of the spirits, counsel hath been given before. There is also another way without *Infusion* or *Mixture*; this is, that the *Liquor* might be continually agitated, either by carriage upon the Water, or by carriage by Land, or by hanging the Vessels upon lines, and daily stirring them, or some such other way: for it is certain, that this *Local motion* doth both subtilize the parts, and doth so incorporate and compact the spirits with the parts, that they have no leisure to turn to sowness, which is a kind of *putrefaction*.

But in extrem old age such a preparation of Meats is to be made, as may be almost in the middle way to *Chylus*. And touching the *Distillations* of Meats, they are meer toys; for the Nutritive part, at least the best of it, doth not ascend in *Vapours*.

The incorporating of Meat and Drink before they meet in the stomach, is a degree to *Chylus*: therefore let *Chickens*, or *Partridges*, or *Pheasants*, or the like, be taken and boiled in water with a little salt, then let them be cleansed and dried, afterward let them be infused in *Must* or *Ale* before it hath done working, with a little *Sugar*.

Also *Grazies* of meat, and the *mincings* of them small well season'd, are good for old persons; and the rather, for that they are destituted of the Office of their *Teeth* in chewing, which is a principal kind of preparation.

And as for the helps of that defect, (namely, of the strength of *Teeth* to grind the Meat) there are three things which may conduce thereunto. First, that new *Teeth* may put forth: that which seems altogether difficult, and cannot be accomplished without an inward and powerful restauration of the body. Secondly, that the *Jaws* be so confirmed by due *Astringents*, that they may in some sort supply the office of the *Teeth*; which may possibly be effected. Thirdly, that the Meat be so prepared, that there shall be no need of chewing; which remedy is at hand.

We have some thought also touching the *Quantity* of the Meat and Drink, that the same taken in a larger quantity at some times, is good for the *irrigation* of the body: therefore both great *Feastings*, and free *Drinkings*, are not altogether to be inhibited. And touching the *Operation* upon the *Aliments*, and the preparation of them, thus much,

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The Operation upon the last Act of Assimilation 8.

Touching the last Act of Assimilation (unto which the three Operations immediately preceeding chiefly tend) our advice shall be brief and single, and the thing it self rather needs explication, than any various Rules.

1. **I**t is certain, that all bodies are endued with some desire of *Assimilating* those things which are next them. This the rare and pneumatical bodies, as *Flame, Spirit, Air* perform generously and with lacrity: on the contrary, those that carry gross and tangible bulk about them, do but weakly, in regard that the desire of *assimilating* other things is bound in by a stronger desire of *Rest*, and containing themselves from *Motion*.
2. Again, it is certain that the desire of *assimilating* being bound, as we said, in a Gross body, and made uneffectual, is somewhat freed and stirred up by the *heat* and *neighbouring Spirit*, so that it is then actuated: which is the onely cause why *Inanimates assimilate not*, and *Animates assimilate*.
3. This also is certain, that the harder the Consistence of the body is, the more doth that body stand in need of a greater heat to prick forward the *assimilation*: which falls out ill for old men, because in them the parts are more obstinate, and the heat weaker; and therefore either the obstinacy of their parts is to be softened, or their heat increased. And as touching the *Malacissation* or *mollifying* of the members, we shall speak afterward, having also formerly propounded many things which pertain to the prohibiting and preventing of this kind of hardness. For the other, touching the increasing of the heat, we will now deliver a single precept, after we have first assumed this *Axiom*.
4. The *Act of assimilation* (which, as we said, is excited by the heat circumsufed) is a motion exceeding acurate, subtil, and in little; now all such motions do then come to their vigour, when the *local motion* wholly ceaseth which disturbeth it. For the *Motion of Separation* into *homogeneous parts*, which is in *Milk*, that the *Cream* should swim above, and the *Whey* sink to the bottom, will never work, if the *Milk* be never so little agitated; neither will any *putrefaction*, proceed in *Water* or *mixt Bodies*, if the same be in continual *Local Motion*. So then, from this *Assumption* we will conclude this for the present Inquisition.
5. The *Act* it self of *Assimilation* is chiefly accomplished in *Sleep* and *Rest*, especially towards the morning, the distribution being finished. Therefore we have nothing else to advise, but that men keep themselves hot in their sleep; and further, that towards the morning there be used some Anointing, or shirt tincted with Oil, such as may gently stir up heat, and after that to fall asleep again. And touching the last *Act of Assimilation* thus much.

The Operation upon the Inteneration of that which begins to be Arefied, or the Malacissation of the Body. 9.

WE have inquired formerly touching the Inteneration from within, which is done by many Windings and Circuits, as well of Alimentation as of Detaining the Spirit from issuing forth, and therefore is accomplished slowly. Now we are to inquire, touching that Inteneration which is from without, and is effected, as it were, suddenly; or touching the Malacissation and suppling of the Body.

The History.

1. **I**N the Fable of restoring Pelias to youth again, Media, when she feigned to do it propounded this way of accomplishing the same, That the Old man's body should be cut into several pieces, and then boiled in a Cauldron with certain Medicaments. There may, perhaps, some boiling be required to this matter, but the cutting into pieces is not needful.

Not.

Notwithstanding, this cutting into pieces seems, in some sort, to be used, not with a Knife, but with Judgment. For whereas the consistence of the *Bowels* and *Parts* is very diverse, it is needful that the *Inteneration* of them both be not effected the same way, but that there be a Cure designed of each in particular, besides those things which pertain to the *Inteneration* of the whole mass of the body; of which, notwithstanding, in the first place.

This Operation (if perhaps it be within our power, is most likely to be done by Baths, Unctions, and the like; concerning which, these things that follow are to be observed.

We must not be too forward in hoping to accomplish this matter, from the Examples of those things which we see done in the *Imbibitions* and *Macerations* of *Inanimates*, by which they are *intenerated*, whereof we introduced some instances before: For this kind of Operation is more easie upon *Inanimates*, because they attract and suck in the Liquor: but upon the bodies of *Living Creatures* it is harder, because in them the motion rather tendeth outward, and to the *Circumference*.

Therefore the *Emollient Baths* which are in use do little good, but on the contrary hurt, because they rather draw forth than make entrance, and resolve the structure of the body, rather than consolidate it.

The Baths and Unctions which may serve to the present Operation (namely, of *Intenerating* the body truly and really) ought to have three properties.

The first and principal is, That they consist of those things, which in their whole substance are like unto the body and flesh of man, and which have a feeding and nursing vertue from without.

The second is, That they be mixed with such things, as through the subtilty of their parts may make entrance, and so insinuate and convey their nourishing vertue into the body.

The third is, That they receive some mixture (though much inferior to the rest) of such things as are *Astringent*, I mean not sowre or tart things, but unctuous and comforting; that while the other two do operate, the exhaling out of the body, which destroyeth the vertue of the things *intenerating*, may (as much as is possible) be *prohibited*; and the motion to the inward parts, by the *Astriction* of the skin, and closing of the passages, may be promoted and furthered.

That which is most *Consubstantial* to the body of man, is warm Blood, either of man, or of some other *Living Creature*: But the device of *Ficinus*, touching the sucking of Blood out of the arm of a wholesome young man, for the restoration of strength in old men, is very frivolous; for that which nourisheth from within, ought no way to be equal or homogeneal to the body nourished, but in some sort inferior and subordinate, that it may be converted. But in things applyed outwardly, by how much the substance is liker, by so much the consent is better.

It hath been anciently received, that a Bath made of the blood of Infants will cure the Leprosie, and heal the flesh already putrefied; insomuch that this thing hath begot envy towards some Kings from the common people.

It is reported that *Heraclius*, for cure of the Dropsie, was put into the warm belly of an Oxe newly slain.

They use the blood of Kittens warm to cure the disease called *St. Anthony's Fire*, and to restore the flesh and skin.

An Arm, or other Member newly cut off, or that upon some other occasion, will not leave bleeding, is with good success put into the Belly of some Creatures newly ripped up; for it worketh potently to stanch the blood; the blood of the member cut off, by consent sucking in, and vehemently drawing to it self the warm blood of the Creature slain, whereby it self is stopped, and retireth.

It is much used in extreme and desperate diseases to cut in two young Pigeons yet living, and apply them to the soles of the feet, and to shift them one after another, whereby sometime there followeth a wonderful ease. This is imputed vulgarly, as if they should draw down the malignity of the disease, but howsoever, this application goeth to the Head, and comforteth the Animal Spirits.

But these bloody Baths and Unctions seem to us fluttish and odious: Let us search out some others, which perhaps have less loathsomeness in them, and yet no less benefit.

17. Next unto warm blood, things alike in substance to the body of a man are *Nutritives* fat fleshes of Oxen, Swine, Dear, Oysters amongst Fishes, Milk, Butter, Yolks of Eggs, Flower of Wheat, sweet Wine, either sugred, or before it be fined.
18. Such things as we would have mixed to make impression, are instead of all *Salts*, especially Bay salt: Also Wine (when it is full of Spirit) maketh entrance, and is an excellent Convoy.
19. *Astringents* of that kind which we described, namely, unctuous and comfortable things, are Saffron, Mastick, Myrrhe, and Myrtle-berries.
20. Of these parts, in our judgment, may very well be made such a Bath as we design: *Physicians* and *Posterity* will find out better things hereafter.
21. But the Operation will be much better, and more powerful, if such a Bath as we have propounded (which we hold to be the principal matter) be attended with a fourfold Course and Order.
22. First, that there go before the Bath a *Frication* of the body, and an *Anointing* with Oyl, with some thickning substance, that the vertue and moistning heat of the Bath may pierce the body, and not the watry part of the Liquor: Then let the Bath follow, for the space of some two hours. After the Bath, let the body be *Emplaistered* with Mastick, Myrrhe, Tragacanth, Diapalma, and Saffron, that the perspiration of the body may (as much as is possible) be inhibited, till the supple matter be by degrees turned into solid. This to be continued for the space of twenty four hours, or more. Lastly, the Emplaistering being removed, let there be an *Anointing* with Oyl mix'd with Salt and Saffron. And let this Bath, together with the Emplaistering and *Unction*, (as before) be renewed every fifth day. This *Malacissation*, or supplying of the body, be continued for one whole Month.
23. Also during the time of this *Malacissation*, we hold it useful and proper, and according to our intention, that men nourish their bodies well, and keep out of the cold Air, and drink nothing but warm drink.
24. Now this is one of those things (as we warned in general in the beginning) whereof we have made no tryal by *Experiment*, but only set it down out of our aiming and levelling at the end: For having set up the Mark, we deliver the Light to others.
25. Neither ought the warmths and cherishings of living bodies to be neglected. *Ficinus* saith, and that seriously enough, That the laying of the young Maid in David's Bosom, was wholesome for him, but it came too late. He should also have added, that the young Maid, after the manner of the Persian Virgins, ought to have been anointed with Myrrhe, and such like, not for deliciousness, but to encrease the vertue of this cherishing by a living body.
26. *Barbarossa* in his extreme old age, by the advice of a *Physitian*, a Jew, did continually apply young Boys to his Stomach and Belly, for warmth and cherishing: Also some old men lay Whelps (Creatures of the hottest kind) close to their Stomachs every night.
27. There hath gone a report, almost undoubted, and that under several names, of certain men that had great Noses, who being weary of the derision of people, have cut off the bunches or hillocks of their Noses, and then making a wide gash in their arms, have held their Noses in the place for a certain time, and so brought forth fair and comely Noses: Which if it be true, it shews plainly the consent of flesh unto flesh, especially in live fleshes.
28. Touching the particular inteneration of the principal Bowels, the Stomach, Lungs, Liver, Heart, Brain, Marrow of the Back-bone, Guts, Reins, Gall, Veins, Arteries, Nerves, Cartilages, Bones, the Inquisition and Direction would be too long, seeing we now set not forth a *Practick*, but certain *Indications* to the *Practick*.

The Operation upon the Purging away of old Juice, and supplying of new Juice; or of Renovation by turns. 10.

The History.

Although those things which we shall here set down have been, for the most part, spoken of before; yet because this Operation is one of the principal, we will handle them over again more at large.

It is certain, that *Dracught-Oxen*, which have been worn out with working, being put into fresh and rich Pastures, will gather tender and young flesh again: and this will appear even to the Taste and Palate; so that the *Inteneration* of flesh is no hard matter. Now it is likely that this *Inteneration* of the flesh being often repeated, will in time reach to the *Inteneration* of the Bones and Membranes, and like parts of the body.

It is certain, that Diets which are now much in use, principally of *Guaiacum*, and of *Sarsaparilla*, *China*, and *Sassafras*, if they be continued for any time, and according to strict Rules, do first attenuate the whole juice of the body, and after consume it, and drink it up. Which is most manifest, because that by these Diets the *French-Pox*, when it is grown even to an hardness, and hath eaten up and corrupted the very marrow of the body, may be effectually cured. And further, because it is manifest, that men, who by these Diets, are brought to be extream lean, pale, and as it were Ghosts, will soon after become fat, well-coloured, and apparently young again: Wherefore we are absolutely of opinion, that such kind of diets in the decline of age, being used every year, would be very useful to our Intention; like the old skin or spoil of *Serpents*.

We do confidently affirm, (neither let any man reckon us among those *Hereticks* which were called *Cathari*) that often Purges, and made even familiar to the body, are more available to long life than Exercises and Sweats: And this must needs be so, if that be held which is already laid for a ground, that Unctions of the body, and Oppression of the passages from without, and exclusion of Air, and detaining of the Spirit within the mass of the body, do much conduce to long life. For it is most certain, that by Sweats, and outward Perspirations, not only the Humours and Excrementitious Vapours are exhaled and consumed, but together with them the Juices also, and good Spirits, which are not so easily repaired: but in Purges (unless they be very immoderate) it is not so, seeing they work principally upon the Humours. But the best Purges for this Intention are those which are taken immediately before Meat, because they dry the body less; and therefore they must be of those Purgers which do least trouble the Belly.

These Intentions of the Operations which we have propounded (as we conceive) are most true, the Remedies faithful to the Intentions. Neither is it credible to be told (although not a few of these Remedies may seem but vulgar) with what care and choice they have been examined by us, that they might be (the Intention not at all impeached) both safe and effectual. Experience, no doubt, will both verifie and promote these matters: And such, in all things, are the works of every prudent counsel, that they are admirable in their Effects, excellent also in their Order, but seeming vulgar in the Way and Means.

The Porches of Death.

WE are now to enquire touching the Porches of Death, that is, touching those things which happen unto men at the point of Death, both a little before and after; that seeing there are many Paths which lead to Death, it may be understood in what Common way

way they all end, especially in those Deaths which are caused by Indigence of Nature, rather than by Violence: although something of this latter also must be inserted, because of the connexion of things.

The History.

1. **T**He living Spirit stands in need of three things that it may subsist; Convenient Motion, Temperate Refrigeration, and Fit Aliment. Flame seems to stand in need but of two of these, namely, Motion and Aliment, because Flame is a simple substance, the Spirit a compounded, insomuch that if it approach somewhat too near to a flamy nature, it overthroweth it self.
2. Also Flame by a greater and stronger Flame is extinguished and slain, as Aristotle well noted, much more the Spirit.
3. Flame, if it be much compressed and freightned, is extinguished: as we may see in a Candle having a Glass cast over it, for the Air being dilated by the heat, doth contrude and thrust together the Flame, and so lesseneth it, and in the end extinguisheth it; and fires on Hearths will not flame, if the Fuel be thrust close together, without any space, for the flame to break forth.
4. Also things fired are extinguished with compression; as if you press a burning coal hard with the Tongs, or the foot, it is straight extinguished.
5. But to come to the Spirit; if Blood or Phlegm get into the Ventracles of the Brain, it causeth sudden death, because the Spirit hath no room to move it self.
6. Also a great blow on the head induceth sudden death, the Spirits being freightned within the Ventracles of the Brain.
7. Opium, and other strong Stupescatives, do coagulate the Spirit, and deprive it of the motion.
8. A venomous Vapour, totally abhorred by the spirit, causeth sudden death: as in deadly poysons, which work (as they call it) by a specifical malignity; for they strike a loathing into the Spirit, that the Spirit will no more move it self, nor rise against a thing so much detested.
9. Also extreme Drunkenness, or extreme Feeding, sometime cause sudden death, seeing the spirit is not only oppressed with over-much condensing, or the malignity of the vapour, (as in Opium and malignant poysons) but also with the abundance of the vapours.
10. Extreme Grief or Fear, especially if they be sudden, (as it is in a sad and unexpected message) cause sudden death.
11. Not only over-much Compression, but also over-much Dilatation of the spirit, is deadly.
12. Joys excessive and sudden have bereft many of their lives.
13. In greater Evacuations, as when they cut men for the Dropsie, the waters flow forth abundantly; much more in great and sudden Fluxes of blood, oftentimes present death followeth: and this happens by the meer flight of Vacuum within the body, all the parts moving to fill the empty places; and amongst the rest, the spirits themselves. For as for slow fluxes of blood, this matter pertains to the indigence of nourishment, not to the diffusion of the spirits. And touching the motion of the spirit so far, either compressed or diffused, that it bringeth death, thus much,
14. We must come next to the want of Refrigeration: Stopping of the breath causeth sudden death; as in all suffocation, or strangling. Now it seems this matter is not so much to be referred to the impediment of Motion, as to the impediment of Refrigeration; for Air over-hot, though attracted freely, doth no less suffocate, than if breathing were hindred; as it is in them who have been sometime suffocated with burning Coals, or with Char-coal, or with walls new-plastered in close Chambers where a fire is made: which kind of death is reported to have been the end of the Emperour Jovian. The like happeneth from dry Baths over-heated, which was practised in the killing of Fausta, Wife to Constantine the Great.
15. It is a very small time which Nature taketh to repeat the breathing, and in which

which the desireth to expel the Foggy Air drawn into the Lungs, and to take in new scarce the third part of a minute.

Again, the beating of the Pulse, and the motion of the Systole and Diastole of the heart, are three times quicker than that of breathing: insomuch, that if it were possible that that motion of the heart could be stopped without stopping the breath, death would follow more speedily thereupon, than by strangling.

Notwithstanding, Use and Custom prevail much in this natural action of breathing: as it is in the Delian Divers and Fishers for Pearl, who by long use can hold their breaths at least ten times longer than other men can do.

Amongst living Creatures, even of those that have Lungs, there are some that are able to hold their breaths a long time, and others that cannot hold them so long, according as they need more or less Refrigeration.

Fishes need less Refrigeration than Terrestrial Creatures, yet some they need, and take it by their Gills. And as Terrestrial Creatures cannot bear the Air that is too hot, or too close, so Fishes are suffocated in waters, if they be totally and long frozen.

If the Spirit be assaulted by another heat greater than it self, it is dissipated and destroyed: for it cannot bear the proper heat without Refrigeration, much less can it bear another heat which is far stronger. This is to be seen in Burning Fevers, where the heat of the putrified humours doth exceed the native heat, even to extinction or dissipation.

The want also and use of Sleep is referred to Refrigeration: For Motion doth attenuate and rarify the spirit, and doth sharpen and increase the heat thereof: Contrarily, Sleep setteth and restraineth the motion and gadding of the same: For though Sleep doth strengthen and advance the actions of the parts and of the liveless spirits, and all that motion which is to the circumference of the body, yet it doth in great part quiet and still the proper motion of the living Spirit. Now Sleep regularly is due unto Humane Nature once within four and twenty hours, and that for six, or five hours at the least; though there are, even in this kind, sometimes Miracles of Nature: As it is recorded of *Mecenas*, that he slept not for a long time before his death. And as touching the want of Refrigeration for conserving of the Spirit, thus much.

As concerning the third Indigence, namely of *Aliment*, it seems to pertain rather to the parts, than to the living Spirit, for a man may easily believe that the living Spirit subsisteth in Identity, not by Succession or Renovation. And as for the reasonable Soul in men, it is above all question, that it is not ingendred of the Soul of the Parents, nor is repaired, nor can die. They speak of the Natural Spirit of living Creatures, and also of Vegetables, which differs from that other Soul essentially and formally: For out of the confusion of these, that same transmigration of Souls, and innumerable other devices of Heathens and Hereticks have proceeded.

The Body of man doth regularly require Renovation by Aliment every day, and a body in health can scarce endure Fasting three days together; notwithstanding, use and custom will do much, even in this case: but in sickness Fasting is less grievous to the body. Also Sleep doth supply somewhat to nourishment; and on the other side, Exercise doth require it more abundantly. Likewise there have some been found who sustained themselves (almost to a Miracle in Nature) a very long time without Meat or Drink.

Dead bodies, if they be not intercepted by Putrefaction, will subsist a long time without any notable Absumption; but living bodies, not above three days, (as we said) unless they be repaired by nourishment: which sheweth that quick Absumption to be the work of the living Spirit, which either repairs it self, or puts the parts into a necessity of being repaired, or both. This is testified by that also which was noted a little before; namely, that living Creatures may subsist somewhat the longer without Aliment, if they sleep: now sleep is nothing else but a reception and retirement of the living Spirit into it self.

An abundant and continual Effluxion of blood, which sometimes happeneth in the Hemorrhoids, sometimes in vomiting of blood, the inward Veins being unlocked or broken, sometimes by wounds, causeth sudden death, in regard that the blood of the Veins ministreth to the Arteries, and the blood of the Arteries to the Spirit.

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The quantity of meat and drink which a man, eating two meals a day, receiveth into his body, is not small; much more than he voideth again either by Stool, or by Urine, or by Sweating. You will say, no marvel, seeing the remainder goeth into the Juices and Substance of the body. It is true; but consider then, that this addition is made twice a day, and yet the body aboundeth not much. In like manner, though the spirit be repaired, yet it grows not excessively in the quantity.

27.

It doth no good to have the Aliment ready, in a degree removed, but to have it of that kind, and so prepared and supplied, that the spirit may work upon it: for the staff of a Torch alone will not maintain the flame, unless it be fed with Wax; neither can men live upon Herbs alone. And from thence comes the *Inconcoction* of old age, that though there be flesh and blood, yet the spirit is become so penurious and thin, and the juices and blood so heartless and obstinate, that they hold no proportion to *Alimentation*.

28.

Let us now cast up the *Accounts* of the *Needs* and *Indigences*, according to the ordinary and usual course of Nature. The Spirit hath need of opening and moving it self in the *Ventricles* of the Brain and Nerves even continually, of the motion of the *Heart* every third part of a moment, of breathing every moment, of sleep and nourishment once within three days, of the power of nourishment commonly till eighty years be past: And if any of these *Indigences* be neglected, *Death* ensueth. So there are plainly three *Porches* of *Death*; destitution of the Spirit in the *Motion*, in the *Refrigeration*, in the *Aliment*.

29.

It is an *Error* to think that the Living Spirit is perpetually generated and extinguished, as *Flame* is; and abideth not any notable time: for even *Flame* it self is not thus out of its own proper nature, but because it liveth amongst *Enemies*; for *Flame* within *Flame* endureth. Now the Living Spirit liveth amongst *Friends*, and all due obsequiousness. So then, as *Flame* is a momentary substance, *Air* is a fixed substance, the Living Spirit is betwixt both.

Touching the extinguishing of the Spirit by the destruction of the *Organs* (which is caused by *Diseases* and *Violence*) we enquire not now, as we foretold in the beginning, although that also endeth in the same three *Porches*. And touching the *Form* of *Death* it self, thus much.

30.

There are two great *Forerunners* of *Death*, the one sent from the *Head*, the other from the *Heart*; *Convulsion*, and the extreme labour of the *Pulse*: for, as for the deadly *Hiccup*, it is a kind of *Convulsion*. But the deadly labour of the *Pulse* hath that unusual swiftness, because the *Heart* at the point of death doth so tremble, that the *Systole* and *Diastole* thereof are almost confounded. There is also conjoyned in the *Pulse* a weakness and lowness, and oftentimes a great intermission, because the motion of the *Heart* faileth, and is not able to rise against the assault stoutly, or constantly.

31.

The immediate proceeding signs of *Death* are, great unquietness and tossing in the Bed, fumbling with the hands, catching and grasping hard, gnashing with the teeth, speaking hollow, trembling of the neather lip, paleness of the face, the memory confused, speecchless, cold sweats, the body shooting in length, lifting up the white of the eye, changing of the whole visage, (as the Nose sharp, Eyes hollow, Cheeks fallen) contraction and doubling of the coldness in the extreme parts of the body, in some, shedding of blood, or sperm, shrieking, breathing thick and short, falling of the neather Chap, and such like.

32.

There follow *Death* a privation of all Sense and Motion, as well of the *Heart* and *Arteries*, as of the *Nerves* and *Joynts*, an inability of the body to support it self upright, stiffness of the *Nerves* and parts, extreme coldness of the whole body; after a little while, putrefaction and stinking.

33.

Eels, *Serpents*, and the *Insects*, will move a long time in every part after they are cut asunder, inasmuch that Country-people think that the parts strive to joyn together again. Also *Birds* will flutter a great while after their heads are pulled off; and the hearts of living creatures will pant a long time after they are plucked out. I remember I have seen the *Heart* of one that was bowelled, as suffering for High *Treason*, that being cast into the fire, leaped at the first at least a foot and half in height, and after, by degrees, lower and lower, for the space, as I remember, of seven or eight minutes. There is also an ancient and credible Tradition of an *Oxe* lowing after his bowels were plucked out. But there is a more certain Tradition of a *Man*, who being under the

Execu-

The History of Life and Death.

331

Executioners hand for High Treason, after his *Heart* was plucked out, and in the Executioners hand, was heard to utter three or four words of prayer: which therefore we said to be more credible than that of the *Oxe* in *Sacrifice*, because the Friends of the party suffering do usually give a reward to the Executioner to dispatch his Office with the more speed, that they may the sooner be rid of their pain; but in *Sacrifices* we see no cause why the Priest should be so speedy in his office.

For reviving those again which fall into sudden *Swooning* and *Catalepses* of *astonishments*, (in which Fits many, without present help, would utterly expire) these things are used, putting into their mouths water distilled of Wine, which they call *Hot-waters*, and *Cordial-waters*, bending the body forwards, stopping the Mouth and Nostrils hard, bending or wringing the Fingers, pulling the hairs of the Beard or Head, rubbing of the Parts, especially the Face and Legs, sudden casting of cold water upon the face, shrieking out aloud, and suddenly; putting *Rose-water* to the Nostrils, with *Vinegar* in faintings; burning of Feathers, or Cloth, in the suffocation of the *Mother*; but especially a *Frying-pan* heated red hot, is good in *Apoplexies*: Also a close imbracing of the body hath helped some.

There have been many examples of men in shew dead, either laid out upon the cold Floor, or carried forth to burial: nay, of some buried in the Earth; which notwithstanding have lived again, which hath been found in those that were buried (the Earth being afterwards opened) by the bruising and wounding of their head, through the struggling of the body within the Coffin; whereof the most recent and memorable example was that of *Joannes Scotus*, called the *Subtil*, and a *School-man*, who being digged up again by his Servant, (unfortunately absent at his burial, and who knew his Masters manner in such fits) was found in that state: And the like happened in our days in the person of a Player, buried at *Cambridge*. I remember to have heard of a certain *Gentleman* that would needs make tryal, in curiosity, what men did feel that were hanged; so he fastened the Cord about his neck, raising himself upon a stool, and then letting himself fall, thinking it should be in his power to recover the Stool at his pleasure, which he failed in, but was helped by a Friend then present. He was asked afterward what he felt: He said he felt no pain, but first he thought he saw before his eyes a great fire, and burning; then he thought he saw all black, and dark: lastly, it turned to a pale blew, or Sea-water green; which colour is also often seen by them which fall into *Swoonings*. I have heard also of a Physitian, yet living, who recovered a man to life which had hanged himself, and had hanged half an hour, by *Frications*, and hot *Baths*: And the same Physitian did profess, that he made no doubt to recover any man that had hanged so long, so his Neck were not broken with the first swing.

The Differences of Youth, and old Age.

THe Ladder of Man's Body is this, to be conceived, to be quickned in the Womb to be born, to suck, to be weaned, to feed upon Pap, to put forth Teeth the first time, about the second year of age, to begin to go, to begin to speak, to put forth Teeth, the second time, about seven years of age, to come to *Puberty* about twelve or fourteen years of age, to be able for Generation, and the flowing of the *Menstrua*, to have hairs about the legs and arm-holes, to put forth a Beard; and thus long, and sometimes later, to grow in stature, to come to full years of strength and agility, to grow grey and bald; the *Menstrua* ceasing, and ability to Generation, to grow decrepit, and a Monster with three legs, to die. Mean while the Mind also hath certain periods, but they cannot be described by years, as to decay in the *Memory*, and the like, of which hereafter.

The Differences of *Youth* and *old Age*, are these: A young man's skin is smooth and plain, an old man's dry and wrinkled, especially about the Forehead and Eyes; a young man's flesh is tender and soft, an old man's hard; a young man hath strength and agility, an old man feels decay in his strength, and is slow of motion; a young man hath

33

34

To the 16 Article.

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hath good digestion, an old man bad; a young mans bowels are soft and succulent, an old man's salt and parched; a young man's body is erect and straight, an old man's bowing and crooked; a young man's limbs are steady, an old man's weak and trembling; the humours in a young man are cholerick, and his blood inclined to heat, in an old man phlegmatick and melancholick, and his blood inclined to coldness; a young man ready for the act of *Venus*, an old man slow unto it; in a young man the juices of his body are more roscid, in an old man more crude and waterish, the spirit in a young man plentiful and boiling, in an old man scarce and jejune; a young man's spirit is dense and vigorous, an old man's eager and rare; a young man hath his senses quick and entire, an old man dull and decayed; a young man's teeth are strong and entire, an old man's weak, worn, and fallen out; a young man's hair is coloured, an old man's (of what colour soever it were) grey; a young man hath hair, an old man baldness; a young man's Pulse is stronger and quicker, an old man's more confused and slower; the diseases of young men are more acute and curable, of old men longer, and hard to cure, a young man's wounds soon close, an old man's later; a young man's cheeks are of a fresh colour, an old man's pale, or with a black blood; a young man is less troubled with Rheums, an old man more: Neither do we know in what things old men do improve, as touching their body, save only sometimes in fatness; whereof the reason is soon given, because old men's bodies do neither perspire well, nor assimilate well: Now fatness is nothing else but an exuberance of nourishment above that which is voided by Excrement, or which is perfectly assimilated. Also some old men improve in the appetite of feeding, by reason of the *acid humours*, though old men digest worst. And all these things which we have said, *Physicians* negligently enough will refer to the *diminution* of the *Natural heat* and *Radical moisture*, which are things of no worth for use: This is certain, *Dryness* in the coming on of years doth forego *Coldness*; and bodies, when they come to the top and strength of heat, do decline in *Driness*, and after that follows *Coldness*.

3.

Now we are to consider the *affections* of the *Mind*. I remember when I was a young man, at *Poitiers* in *France*, I conversed familiarly with a certain *French-man*, a witty young man, but something talkative, who afterwards grew to be a very *Eminent* man: he was wont to inveigh against the manners of *old men*, and would say, That if their *Minds* could be seen as their *Bodies* are, they would appear no less deformed. Besides, being in love with his own Wit, he would maintain, that the *Vices* of *old men's Minds* have some correspondence, and were parallel to the putrefactions of their *Bodies*: For the dryness of their skin, he would bring in *Impudence*; for the hardness of their bowels, *Unmercifulness*; for the lippitude of their eyes, an *evil Eye*, and *Envy*; for the casting down of their eyes, and bowing their body towards the Earth, *Atheism*; (for, saith he, they look no more up to Heaven as they are wont) for the trembling of their members, *Irresolution* of their *Decrees* and *light Inconstancy*; for the bending of their fingers, as it were to catch, *Rapacity* and *Covetousness*; for the buckling of their knees, *Fearfulness*; for their wrinkles, *Craftiness* and *Obliquity*; and other things which I have forgotten. But to be serious, a young man is modest and shamefaced, an old man's Forehead is hardened, a young man is full of bounty and mercy, an old man's heart is brawny; a young man is affected with a laudable emulation, an old man with a malignant envy; a young man is inclined to Religion and Devotion, by reason of his Fervency and Inexperience of evil, an old man cooler in Piety through the coldness of his Charity, and long conversation in evil, and likewise through the difficulty of his belief; a young man's desires are vehement, an old man's moderate: a young man is light and moveable, an old man more grave and constant: a young man is given to *Liberality*, and *Beneficence*, and *Humanity*, an old man to covetousness, wisdom for his own self, and seeking his own ends: a young man is confident, and full of hope, an old man diffident, and given to suspect most things: a young man is gentle and obsequious, an old man froward and disdainful: a young man is sincere, and open-hearted, an old man cautelous and close: a young man is given to desire great things, an old man to regard things necessary: a young man thinks well of the present times, an old man preferreth times past before them: a young man reverenceth his Superiours, an old man is more forward to tax them: and many other things, which pertain rather to Manners, than to the present Inquisition. Notwithstanding old men, as in some things they improve in their Bodies, so also in their Minds, unless they be altogether out of date: namely, that as they are less apt for Invention,

tion, so they excel in judgment, and prefer safe things, and sound things, before specious: Also they improve in Garrulity and Ostentation, for they seek the fruit of speech while they are less able for action: So as it was not absurd that the Poets feigned old Typhon to be turned into a Grasshopper.

Moveable Canons of the Duration of Life and Form of Death.

Canon I.

Consumption is not caused, unless that which is departed with by one body, passeth into another.

The Explication.

There is in Nature no annihilating, or reducing to nothing: Therefore that which is consumed, is either resolved into Air, or turned into some Body adjacent. So we see a Spider, or Fly, or Ant in Amber, intombed in a more stately Monument than Kings are; to be laid up for Eternity, although they be but tender things, and soon dissipated: But the matter is this, that there is no Air by, into which they should be resolved, and the substance of the Amber is so heterogeneous, that it receives nothing of them. The like we conceive would be if a stick, or root, or some such thing were buried in Quick-silver: also Wax, and Honey, and Gums have the same Operation, but in part only.

Canon II.

There is in every Tangible Body a Spirit, covered and encompassed with the grosser parts of the body, and from it all Consumption and Dissolution hath the beginning.

The Explication.

NO Body known unto us here in the upper part of the Earth is without a Spirit, either by Attenuation and Concoction from the heat of the Heavenly Bodies, or by some other way: for the Concavities of Tangible things receive not Vacuum, but either Air, or the proper Spirit of the thing. And this Spirit whereof we speak, is not some Virtue, or Energie, or Aër, or a Trifle, but plainly a Body, rare and invisible; notwithstanding circumscribed by Place, Quantitative, Real. Neither again is that Spirit Air, (no more than Wine is Water) but a Body rarefied, of kin to Air, though much different from it. Now the grosser parts of bodies (being dull things, and not apt for motion) would last a long time; but the Spirit is that which troubleth, and plucketh, and undermineth them, and converteth the moisture of the body, and whatsoever it is able to digest, into new Spirit; and then as well the pre-existing Spirit of the body, as that newly made fly away together by degrees. This is best seen by the Diminution of the weight in bodies dried through Perspiration; for neither all that which is issued forth was Spirit when the body was ponderous, neither was it not Spirit when it issued forth.

Canon III.

The Spirit issuing forth Dryeth; detained and working within either melteth, or putrefieth, or vivifieth.

The Explication.

There are four Processes of the Spirit; to Arefaction, to Colliquation, Putrefaction, to Generation of bodies. Arefaction is not the proper work of the Spirit, but of the grosser parts after the Spirit issued forth; for then they contract themselves partly by their flight of Vacuum, partly by the union of the Homogeneals: as appears in all things which are Arefied by Age, and in the dryer sort of bodies which have passed the fire; as Bricks, Charcoal, Bread. Colliquation is the meer work of the Spirit; neither is it done, but when they are excited by heat: for when the Spirits dilating themselves, yet not getting forth, do insinuate and disperse themselves among the grosser parts, and so make them soft and apt to run, as it is in Metals and Wax: for Metals, and all tenacious things, are apt to inhibit the Spirit; that being

excited, it issueth not forth. *Putrefaction* is a mixed work of the Spirits, and of the grosser parts; for the Spirit (which before restrained and bridled the parts of the thing) being partly issued forth, and partly infeebled all things in the body do dissolve and return to their *Homogeneities*, or (if you will) to their Elements: that which was Spirit in it is congregated to it self, whereby things putrefied begin to have an ill savour: the *Oily* parts to themselves, whereby things putrefied have that slipperiness and unctuousity; the *watry* parts also to themselves, the *Dregs* to themselves: whence followeth that *confusion* in bodies putrefied. But *Generation* or *Vivification* is a work also mixed of the Spirit and grosser parts, but in a far different manner; for the Spirit is totally detained, but it swelleth and moveth locally; and the grosser parts are not dissolved, but follow the motion of the spirit; and are, as it were, blown out by it, and extruded into divers figures, from whence cometh that *Generation* and *Organization*: and therefore *Vivification* is always done in a matter tenacious and clammy, and again, yielding and soft, that there may be both a detention of the spirit, and also a gentle cession of the parts, according as the spirit forms them. And this is seen in the matter, as well of all Vegetables, as of living Creatures, whether they be ingendred of *Putrefaction*, or of *Sperm*; for in all these things there is manifestly seen a matter hard to break through, easie to yield.

Canon IV.

IN all living Creatures there are two kinds of Spirits: Liveless Spirits, such as are in bodies Inanimate; and a Vital Spirit superadded.

The Explication.

IT was said before, that to procure long life, the Body of Man must be considered first, as *Inanimate*, and not repaired by nourishment: secondly, as *Animate*, and repaired by nourishment: For the former, consideration gives Laws touching *Consumption*, the latter touching *Reparation*. Therefore we must know, that there are in humane flesh Bones, Membranes, Organs: Finally, in all the parts such spirits diffused in the substance of them while they are alive, as there are in the same things (Flesh, Bones, Membranes, and the rest) separated and dead, such as also remain in a *Carkass*: but the *Vital Spirit*, although it ruleth them, and hath some consent with them, yet it is far differing from them, being integral, and subsisting by it self. Now there are two special differences betwixt the *liveless Spirit*, and the *vital Spirits*: The one, that the *liveless Spirits* are not continued to themselves, but are, as it were, cut off, and incompassed with a gross body, which intercepts them, as *Air* is mixed with *Snow* or *Froth*; but the *vital Spirit* is all continued to it self by certain Conduit-pipes through which it passeth, and is not totally intercepted. And this Spirit is twofold also; the one branched, only passing through small Pipes, and, as it were, strings, the other hath a *Cell* also, so as it is not only continued to it self, but also congregated in an hollow space in reasonable good quantity, according to the Analogy of the body; and in that *Cell* is the Fountain of the Rivulets which branch from thence. The *Cell* is chiefly in the Ventricles of the Brain, which in the ignobler sort of Creatures are but narrow, inso-much that the spirits in them seem scattered over their whole body, rather than Celled; as may be seen in *Serpents*, *Eels*, and *Flies*, whereof every of their parts move long after they are cut asunder. *Birds* also leap a good while after their heads are pulled off, because they have little Heads, and little Cells: But the Nobler sort of Creatures have those Ventricles larger, and Man the largest of all. The other difference betwixt the Spirits is, that the vital Spirit hath a kind of inkindling, and is like a Wind or Breath compounded of Flame and Air, as the Juices of living Creatures have both *Oyl* and *Water*. And this inkindling ministreth peculiar motions and faculties: for the Smoak which is inflamable, even before the Flame conceived, is hot, thin, and moveable, and yet it is quite another thing after it is become Flame: but the inkindling of the vital spirits is by many degrees gentler than the softest Flame, as of Spirit of Wine, or other wise; and besides, it is in great part mixed with an *Aerial* substance, that it should be a *Mystery* or *Miracle*, both of a *Flammeous* and *Aereous* nature.

Canon V.

THe Natural Actions are proper to the several Parts, but it is the Vital Spirit that excites and sharpens them.

The Explication.

THe Actions or Functions which are in the several Members, follow the nature of the Members themselves, (*Attraction, Retention, Digestion, Assimilation, Separation, Excretion, Perspiration* even *Sense* it self) according to the propriety of the several Organs, (the *Stomach, Liver, Heart, Spleen, Gall, Brain, Eye, Ear*, and the rest:) yet none of these Actions would ever have been actuated but by the vigour and presence of the *Vital Spirit*, and heat thereof: as one *Iron* would not have drawn another *Iron*, unless it had been excited by the *Load-stone*; nor an *Eggs* would ever have brought forth a *Bird*, unless the substance of the *Hen* had been actuated by the treading of the *Cock*.

Canon VI.

THe liveless Spirits are next Consubstantial to Air; the vital Spirits approach more to the substance of Flame.

The Explication.

THe Explication of the precedent fourth Canon is also a Declaration of this present Canon: But yet further, from hence it is, that all fat and oily things continue long in their being: For neither doth the *Air* much pluck them, neither do they much desire to joyn themselves with *Air*. As for that conceit, it is altogether vain, that *Flame* should be *Air* set on fire, seeing *Flame* and *Air* are no less *Heterogeneous*, than *Oyl* and *Water*. But whereas it is said in the Canon, that the *vital spirits* approach more to the substance of *Flame*; it must be understood, that they do this more than the *liveless spirits*, not that they are more *Flamy* than *Airy*.

Canon VII.

THe Spirit hath two Desires; one of multiplying it self, the other of flying forth, and congregating it self with the Connaturals.

The Explication.

THe Canon is understood of the *liveless spirits*; for as for the *second Desire*, the *vital spirit* doth most of all abhor flying forth of the body, for it finds no Connatural here below to joyn withal: Perhaps it may sometimes fly to the outward parts of the body, to meet that which it loveth; but the flying forth, as I said, it abhorreth. But in the *liveless spirits* each of these two Desires holdeth. For to the former this belongeth, Every spirit seated amongst the grosser parts dwelleth unhappily; and therefore when it finds not a like unto it self, it doth so much the more labour to create and make a like, as being in a great solitude; and endeavour earnestly to multiply it self, and to prey upon the volatile of the grosser parts, that it may be encreased in quantity. As for the *second Desire* of flying forth, and betaking it self to the *Air*, it is certain, that all light things (which are ever moveable) do willingly go unto their Likes near unto them, as a *Drop* of water is carried to a *Drop*, *Flame* to *Flame*; but much more this is done in the flying forth of spirit into the *Air Ambient*, because it is not carried to a Particle like unto it self, but also as unto the *Globe* of the *Connaturals*. Mean while this is to be noted, that the going forth, and flight of the spirit into *Air* is a redoubled action, partly out of the appetite of the spirit, partly out of the appetite of the *Air*; for the common *Air* is a needy thing, and receiveth all things speedily, as *Spirits, Odours, Beams, Sounds*, and the like.

Canon VIII.

Spirit detained, if it have no possibility of begetting new spirits, it encreateth the grosser parts.

The Explication.

Generation of new Spirit is not accomplished but upon those things which are in some degree near to the spirit, such as are humid bodies. And therefore if the grosser parts (amongst which the Spirit converseth) be in a remote degree, although the spirit cannot convert them, yet (as much as it can) it weakneth, and softneth, and subdueth them, that seeing it cannot encrease in quantity, yet it will dwell more at large, and live amongst good Neighbours and Friends. Now this Aphorism is most useful to our end, because it tendeth to the Inteneration of the obstinate parts by the detention of the spirit.

Canon IX.

THe Inteneration of the harder parts cometh to good effect, when the Spirit neither flieth forth, nor begetteth new Spirit.

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The Explication.

THis Canon solveth the knot and difficulty in the Operation of Intenerating by the Detention of the Spirit: for if the Spirit not flying forth wasteth all within, there is nothing gotten to the Inteneration of the parts in their subistence, but rather they are dissolved and corrupted. Therefore together with the Detention, the Spirit ought to be cooled and restrained, that they may not be too active.

Canon X

The heat of the Spirit to keep the body fresh and green, ought to be Robust, not Eager.

The Explication.

Also this Canon pertaineth to the solving of the knot aforesaid, but it is of a much larger extent, for it setteth down of what temperament the heat in the body ought to be for the obtaining of long life. Now this is useful, whether the Spirit be detained, or whether they be not. For howsoever the heat of the Spirit must be such, as it may rather turn it self upon the hard parts, than waste the soft; for the one desiccates, the other intenerates. Besides, the same thing is available to the well-perfecting of Assimilation; for such an heat doth excellently excite the faculty of Assimilation, and withal doth excellently prepare the matter to be assimilated. Now the properties of this kind of heat ought to be these: First, that it be slow, and heat not suddenly: Secondly, that it be not very intense, but moderate: Thirdly, that it be equal, not incompounded; namely, intending and remitting it self: Fourthly, that if this heat meet any thing to resist it, it be not easily suffocated or languish. This Operation is exceeding subtil, but seeing it is one of the most useful, it is not to be deserted. Now in those Remedies which we propounded to invest the spirits with a Robust heat, or that which we call Operative, not Predatory, we have in some sort satisfied this matter.

Canon XI.

The Condensing of the Spirits in their substance, is available to long life.

The Explication.

THis Canon is subordinate to the next precedent, for the Spirit condensed receiveth all those four properties of heat whereof we speak; but the ways of Condensing them are set down in the first of the ten Operations.

Canon XII.

The Spirit in great quantity hasteneth more to flying forth, and preyeth upon the body more, than in small quantity.

The Explication.

THis Canon is clear of it self, seeing meer Quantity doth regularly encrease vertue. And it is to be seen in flames, that the bigger they are, the stronger they break forth, and the more speedily they consume. And therefore over-great plenty, or exuberance of the spirits, is altogether hurtful to long life; neither need one with a greater store of spirits, than what is sufficient for the Function of life, and the Office of a good Reparation.

Canon XIII.

The Spirit equally dispersed, maketh less haste to fly forth, and preyeth less upon the body, than unequally placed.

The Explication.

Not only abundance of spirits, in respect of the whole, is hurtful to the Duration of things, but also the same abundance, unevenly placed, is in like manner hurtful: and therefore the more the spirit is shred and inserted by small portions, the less it preyeth; for Dissolution ever beginneth at that part where the spirit is looser. And therefore both Exercise and Frictions conduce much to long life, for Agitation doth finelyest diffuse and commix things by small portions.

Canon XIV.

The inordinate and subsultory motion of the spirits doth more hasten to going forth, and doth prey upon the body more, than the constant and equal.

The Explication.

In Inanimates this Canon holds for certain, for inequality is the Mother of Dissolution; but in Animates (because not only the Consumption is considered, but the Repara

Reparation, and Reparation proceedeth by the Appetites of things, and Appetite is sharpened by variety) it holdeth not rigorously; but it is so far forth to be received, that this variety be rather an alternation or interchange, than a confusion; and, as it were, constant in inconstancy.

Canon XV.

The Spirit in a Body of a solid compoſure is detained, though unwillingly.

The Explication.

ALL things do abhor a *Solution* of their *Continuity*, but yet in proportion to their *Density* or *Rarity*: for the more rare the bodies be, the more do they suffer themselves to be thrust into small and narrow passages: for *water* will go into a passage which *dust* will not go into, and *Air* which *water* will not go into, nay, *flame* and *spirit* which *Air* will not go into. Notwithstanding of this thing, there are some bounds, for the *spirit* is not so much transported with the desire of going forth, that it will suffer it self to be too much discontinued, or be driven into over-streight pores and passages; and therefore if the *spirit* be encompassed with an *hard* body, or else with an *unctuous* and *tenacious*, (which is not easily divided) it is plainly bound; and, as I may say, imprisoned, and layeth down the appetite of going out; wherefore we see that *Metals* and *Stones* require a long time for their *spirit* to go forth, unless either the *spirit* be excited by the fire, or the grosser parts be dislevered with corroding and strong waters. The like reason is there of *tenacious* bodies, such as are *Gums*, save only that they are melted by a more gentle heat: and therefore the *Juices* of the body hard, a close and compact skin, and the like, (which are procured by the driness of the *Aliment*, and by *Exercise*, and by the coldness of the *Air*) are good for long life, because they detain the *spirit* in close prison, that it goeth not forth.

Canon XVI.

In Oily and Fat things the Spirit is detained willingly, though they be not tenacious.

The Explication.

THE *spirit*, if it be not irritated by the Antipathy of the body inclosing it, nor fed by the over-much likeness of that body, nor solicited nor invited by the external body, it makes no great stir to get out: all which are wanting to *Oily* bodies; for they are neither so pressing upon the *spirits* as *hard* bodies, nor so near as *watry* bodies, neither have they any good agreement with the *Air Ambient*.

Canon XVII.

The speedy flying forth of the Watry Humour, conserves the Oily the longer in his being.

The Explication.

WE said before, that the *Watry Humours*, as being consubstantial to the *Air*, fly forth soonest; the *Oily* later, as having small agreement with the *Air*. Now whereas these two humours are in most bodies, it comes to pass that the *Watry* doth in a sort betray the *Oily*, for that issuing forth insensibly carrieth this together with it. Therefore there is nothing more furthereth the conservation of bodies, than a gentle drying of them, which causeth the *watry* humour to expire, and inviteth not the *Oily*; for then the *Oily* enjoyeth the proper nature. And this tendeth not only to the inhibiting of *Putrefaction*, (though that also followeth) but to the conservation of *Greenness*. Hence it is, that gentle *Frications*, and moderate *Exercises*, causing rather *Perspiration* than *Sweating*, conduce much to long life.

Canon XVIII.

Air excluded conferreth to long life, if other inconveniences be avoided.

The Explication.

WE said a little before, that the flying forth of the *Spirit* is a redoubled action, from the appetite of the *Spirit*, and of the *Air*; and therefore if either of these be taken out of the way, there is not a little gained. Notwithstanding divers inconveniences follow hereupon, which how they may be prevented, we have shewed in the second of our *Operations*.

Canon XIX.

Youthful Spirits inserted into an old Body, might soon turn Natures course back again.

The Explication.

THe nature of the *Spirits* is as the uppermost *Wheel*, which turneth about the other *Wheels* in the body of man; and therefore in the *Intention* of long life, that ought to be first placed. Hereunto may be added, that there is an easier and more expedite way to alter the *spirits*, than to other *Operations*. For the *Operation* upon the *spirits* is two-fold; the one by *Aliments*, which is slow, and, as it were, about; the other, (and that two-fold) which is sudden, and goeth directly to the *spirits*, namely, by *Vapours*, or by the *Afflictions*.

Canon XX.

Juices of the Body hard and roscid are good for long life.

The Explication.

THe reason is plain, seeing we shewed before, that *hard* things, and *oily* or *roscid*, are hardly dissipated: notwithstanding there is difference, (as we also noted in the tenth *Operation*) that *Juice* somewhat *hard* is indeed less dissippable, but then it is withal less reparable; therefore a *Convenience* is interlaced with an *Inconvenience*, and for this cause no wonderful matter will be atchieved by this. But *roscid* *juice* will admit both *operations*; therefore this would be principally endeavoured.

Canon XXI.

Whatsoever is of thin parts to penetrate, and yet hath no Acrimony to bite, begetteth Roscid Juices.

The Explication.

THis Canon is more hard to practise than to understand. For it is manifest, whatsoever penetrateth well, but yet with a *sting* or *tooth*, (as do all sharp and sower things) it leaveth behind it, wheresoever it goeth, some mark or print of *driness* and *cleaving*, so that it hardneth the *juices*, and chappeth the *parts*: Contrarily, whatsoever things penetrate through their *thinness* meerly, as it were by *stealth*, and by way of *insinuation* without violence, they *bedew* and *water* in their passage. Of which sort we have recounted many in the fourth and seventh *Operations*.

Canon XXII.

Assimilation is best done when all Local Motion is expended.

The Explication.

THis Canon we have sufficiently explained in our Discourse upon the eighth *Operation*.

Canon XXIII.

Alimentation from without, at least some other way than by the Stomach, is most profitable for long life, if it can be done.

The Explication.

WE see that all things which are done by *Nutrition* ask a long time, but those which are done by *imbracing* of the *like* (as it is in *Infusions*) require no long time. And therefore *Alimentation* from without would be of principal use; and so much the more, because the *Faculties* of *Concoction* decay in old age: so that if there could be some *Auxiliary* *Nutritions* by *Bubblings*, *Unctions*, or else by *Clysters*, these things in conjunction might do much; which single are less available.

Canon XXIV.

Where the Concoction is weak to thrust forth the Aliment, there the Outward parts should be strengthened to call forth the Aliment.

The Explication.

That which is propounded in this Canon, is not the same thing with the former, for it is one thing for the *outward* *Aliment* to be attracted *inward*, another for the *inward* *Aliment* to be attracted *outward*: yet herein they concur, that they both help the weakness of the *inward* *Concoctions*, though by divers ways.

Canon XXV.

ALL sudden Renovation of the Body is wrought either by the Spirit, or by Malaciffations.

The Explication.

THere are two things in the Body, *Spirits* and *Parts*: to both these the way by *Nutrition* is long and about; but it is a short way to the *Spirits* by *Vapours*, and by the *Afflictions*, and to the *Parts* by *Malaciffations*. But this is diligently to be noted, that by no means we confound *Alimentation* from without with *Malaciffation*; for the intention of *Malaciffation* is not to nourish the parts, but only to make them more fit to be nourished.

Canon

Canon XXVI.

Malaciffation is wrought by *Consubstantials*, by *Imprinters*, and by *Clofers* up.

The Explication.

THe reason is manifest, for that *Consobstantials* do properly supple the body, *Imprinters* do carry in, *Clofers* up do retain and bridle the *Perspiration*, which is a motion opposite to *Malaciffation*. And therefore (as we described in the ninth Operation) *Malaciffation* cannot well be done at once, but in a course or order. First, by excluding the *Liquor* by *Thickners*: for an outward and gross Infusion doth not well compact the body: that which entrencheth must be subtil, and a kind of vapour. Secondly, by *Intenerating* by the consent of *Consobstantials*: for bodies upon the touch of those things which have good agreement with them, open themselves, and relax their pores. Thirdly, *Imprinters* are *Convoys*, and insinuate into the parts the *Consobstantials*, and the mixture of gentle *Astringents* doth somewhat restrain the *Perspiration*. But then, in the fourth place, follows that great *astriction* and *closure* up of the body by *Emplaistration*, and then afterward by *Inunction*, until the *Supple* be turned into *Solid*, as we said in the proper place.

Canon XXVII.

Frequent Renovation of the Parts Repairable, watereth and reneweth the less Repairable also.

The Explication.

VVE said in the Preface to this History, that the way of Death was this, That the Parts reparable died in the fellowship of the Parts less reparable: so that in the repairation of these same less reparable Parts, all our forces would be employed. And therefore being admonished by *Aristotle's* observation, touching Plants, namely, That the putting forth of new shoots and branches refresheth the body of the Tree in the passage; we conceive the like reason might be, if the flesh and blood in the body of man were often renewed, that thereby the bones themselves, and membranes, and other parts, which in their own nature are less reparable, partly by the cheerful passage of the Juices, partly by that new cloathing of the young flesh and blood, might be watered and renewed.

Canon XXVIII.

Refrigeration, or Cooling of the body, which passeth some other ways than by the Stomach, is useful for long life.

The Explication.

THe reason is at hand: for seeing a Refrigeration not temperate, but powerful, (especially of the blood) is above all things necessary to long life: this can by no means be effected from within as much as is requisite, without the destruction of the Stomach and Bowels.

Canon XXIX.

That Intermixing, or Intangling, that as well Consumption as Reparation are the works of Heat, is the greatest obstacle to long life.

The Explication.

Almost all great works are destroyed by the Natures of things Intermixed, when as that which helpeth in one respect, hurteth in another: therefore men must proceed herein by a sound judgment, and a discrete practice. For our part, we have done so far as the matter will bear, and our memory serveth us, by separating benign heats from hurtful, and the Remedies which tend to both.

Canon XXX.

Curing of Diseases is effected by Temporary Medicines; but Lengthning of Life requireth Observation of Diets.

The Explication.

THose things which come by accident, as soon as the causes are removed, cease again; but the continual course of Nature, like a running River, requires a continual rowing and sailing against the stream, therefore we must work regularly by Diets. Now Diets are of two kinds: Set Diets, which are to be observed at certain times, and Familiar Diet, which is to be admitted into our daily repast: But the Set Diets are the more potent, that is, a course of Medicines for a time; for those things which are of so great virtue that they are able to turn Nature back again, are, for the most part, more strong, and more speedily altering, than those which may without danger be received into a continual use. Now in the Remedies set down in our Intentions, you shall

shall find only three set Diets, the *Oprate Diet*, the *Diet Malacissant* or *Suppling*, and the *Diet Emaciant* and *Renewing*. But amongst those which we prescribed for *Familiar Diet*, and to be used daily, the most efficacious are these that follow, which also come not far short of the vertue of Set Diets: *Nitre*, and the *subordinates* to *Nitre*; the *Regiment* of the *Affections*, and *course* of our *Life*; *Refrigeratours* which pass not by the *Stomach*; *Drinks* *Resciding*, or *ingendring Oily Juices*; besprinkling of the blood with some firmer matter, as *Pearls*, certain *Woods*, competent *Unctions* to keep out the *Air*, and to keep in the *Spirit*; *Heaters* from without, during the *Assimilation* after sleep; avoiding of those things which inflame the *Spirit*, and put it into an eager heat, as *Wine* and *Spices*. Lastly, a moderate and seasonable use of those things which endue the spirits with a Robust heat, as *Saffron*, *Crosses*, *Garlick*, *Elecampane*, and *compound Opiales*.

Canon XXXI.

The Living Spirit is instantly extinguished, if it be deprived either of Motion, or of Refrigeration, or of Aliment.

The Explication.

NAmely, these are those three which before we called the *Porches of Death*, and they are the proper and immediate passions of the *Spirit*. For all the *Organs* of the principal parts serve hereunto; that these three *Offices* be performed; and again, all destruction of the *Organs* which is deadly brings the matter to this point, that one or more of these three fail: Therefore all other things are the divers ways to *Death*, but they end in these three. Now the whole *Fabrick* of the *Parts* is the *Organ* of the *Spirit*; as the *Spirit* is the *Organ* of the *Reasonable Soul*, which is *Incorporeous* and *Divine*.

Canon XXXII.

Flame is a Momentany Substance, Air a Fixed; the Living Spirit in Creatures is of a middle Nature.

The Explication.

THis matter stands in need both of an higher Indagation, and of a longer Explication, than is pertinent to the present Inquisition. Mean while we must know this, that *Flame* is almost every moment generated and extinguished; so that it is continued only by succession; but *Air* is a *fixed body*, and it not dissolved: for though *Air* begets new *Air* out of watery moisture, yet notwithstanding the old *Air* still remains; whence cometh that *Super-operation* of the *Air* whereof we have spoken in the Title *De Ventis*. But *Spirit* is participant of both Natures, both of *Flame* and *Air*, even as the nourishments thereof are, as well *Oyl*, which is homogeneous to *Flame*, as *Water*, which is homogeneous to *Air*: for the *Spirit* is not nourished either of *Oily* alone, or of *Watry* alone, but of both together; and though *Air* doth not agree well with *Flame*, nor *Oyl* with *Water*, yet in a *mix'd body* they agree well enough. Also the *Spirit* hath from the *Air* his easie and delicate impressions and yieldings, and from the *Flame* his Noble and Potent Motions and Activities. In like manner the *Duration* of *Spirit* is a mixed thing, being neither so momentany as that of *Flame*, nor so fixed as that of *Air*: And so much the rather it followeth not the condition of *Flame*, for that *Flame* it self is extinguished by accident, namely, by contraries, and Enemies environing it; but *Spirit* is not subject to the like conditions and necessities. Now the *Spirit* is repaired from the lively and florid blood of the small *Arteries* which are inserted into the *Brain*; but this Reparation is done by a peculiar manner, of which we speak not now.

F I N I S.

ARTICLES
OF
ENQUIRY,
TOUCHING
METALS & MINERALS.

Written by the Right Honourable
FRANCIS BACON,
BARON of VERULAM,
Viscount *St. Albans*.

Thought fit to be added, to this WORK
OF HIS
NATURAL HISTORY.

Newly put forth in the YEAR, 1661.
By the former Publisher.



LONDON,
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ARTICLES

OF THE

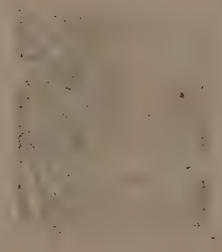
CONSTITUTION

OF THE UNITED STATES

OF AMERICA

AND

THE



ADOPTED BY THE CONVENTION



ARTICLES OF ENQUIRY, TOUCHING METALS & MINERALS.



He first Letter of the Alphabet is, the Compounding
Incorporating or Union, of Metals or Minerals.

With what Metals Gold will incorporate, by Simple
Colliquefactions, and with what not? and in what
quantity it will incorporate? and what kind of Body
the Compound makes?

Gold with Silver, which was the ancient *Electrum*.

Gold with Quick-silver.

Gold with Lead.

Gold with Copper.

Gold with Brass.

Gold with Iron.

Gold with Tin.

So likewise of Silver.

Silver with Quick-silver.

Silver with Lead.

Silver with Copper.

Silver with Brass.

Silver with Iron.

Silver with Tin.

Articles of Enquiry,

So likewise of Quick-silver.

Quick-silver with Lead.

Quick-silver with Copper.

Quick-silver with Brass.

Quick-silver with Iron.

Quick-silver with Tin.

So of Lead

Lead with Copper.

Lead with Brass.

Lead with Iron.

Lead with Tin.

So of Copper.

Copper with Brass.

Copper with Iron.

Copper with Tin.

So of Brass.

Brass with Iron.

Brass with Tin.

So of Iron.

Iron with Tin.

What are the Compound Metals, which are common, and known? And what are the Propositions of their mixtures? As

Latin of Brass, and the Calaminar-stone.

Bell-metal of, &c.

The counterfeit Plate, which they call Alchumy.

The Decomposites of three Metals or more, are too long to enquire, except there be some Comportions of them already observed.

It is also to be observed, Whether any two Metals which will not mingle of themselves, will mingle with the Help of another; and what?

What Compounds will be made of Metal with Stone, and other Fossiles? As Lattin is made with Brass, and the Calaminar-stone. As all the Metals with Vitriol: All with Iron powdered. All with Flint, &c.

some few of these would be enquired of, to disclose the Nature of the Rest.

WHether Metals, or other Fossiles, will incorporate with Molten Glas? and what Body it makes?

The quantity in the mixture would be well considered: For some small quantity, perhaps would incorporate; as in the Allays of Gold, and Silver Coyn.

Upon the Compound Body, three things are chiefly to be observed. The Colour, the Fragility or Pliantness, the Volatility or Fixation, compared with the Simple Bodies.

For present use or profit; this is the Rule. Consider the price of the two Simple Bodies, consider again the Dignity of the one above the other

other, in use. Then see, if you can make a compound that will save more in the price, then it will lose in the dignity of the use. As for example, Consider the price of Brass Ordnance; consider again the price of Iron Ordnance; and consider, wherein the Brass Ordnance doth excel the Iron Ordnance in use. Then if you can make a Compound of Brass and Iron Ordnance, that will be near as good in use, and much cheaper in price, there is profit both to the private, and to the Commonwealth.

So of Gold and Silver, the price is double of Twelve. The Dignity of Gold above Silver is not much, the splendor is alike, and more pleasing to some eye. As in Cloth of Silver, Silver Lace, silvered Rapiers, &c. The main dignity is, that Gold bears the fire, which Silver doth not; but that is an excellency in Nature, but it is nothing at all in use. For any dignity in use, I know none, but that Silvering will sully and canker more than Gilding; which if it may be corrected, with a little mixture of Gold, there is profit: And I do somewhat marvel, that the latter Ages have lost the ancient *Flectrum*, which was a mixture of Silver with Gold; whereof, I conceive, there may be much use both in Coyn, Plate, and Gilding.

It is to be noted, that there is in the Version of Metals, impossibility, or at least great difficulty; as in making of Gold, Silver, Copper: On the other side, in the adulterating or counterfeiting of Metals there is deceit and Villany; but it should seem there is a middle way, and that is by new compounds, if the ways of incorporating were well known.

What Incorporation or Imbibition Metals will receive from Vegetables, without being dissolved, might be inquired. As when the Armorers make their Steel more tough and plyant by the aspersing of Water, or Juice of Herbs: When Gold being grown somewhat churlish by recovering, is made more plyant by throwing in shreds of Tanned Leather, or by Leather oyled.

Note, that in these, and the like shews of Imbibition, it were good to try by the weight, whether the weight be increased or no? for if it be not, it is to be doubted, that there is no Imbibition of Substance: but onely, that the Application of the other Body, doth dispose and invite the Metal to another posture of parts than of it self it would have taken.

After the Incorporation of Metals, by simple Colliquefaction, for the better discovery of the Nature: And Consents and Dissents of Metals by incorporating of their Dissolutions, it would be enquired.

What Metals being dissolved by Strong-waters, will incorporate well together, and what not? which is to be inquired particularly, as it was in Colliquefactions.

There is to be observed in those Dissolutions, which will not incorporate what the effects are: As the Ebullition, the Precipitation to the bottom, the Ejaculation towards the top, the Suspension in the midst and the like.

Note, that the Dissents of the Menstrua, or Strong-waters, may hinder the Incorporation, as well as the Dissents of the Metals themselves: Therefore where the Menstrua are the same, and yet the Incorporation followeth not, you may conclude, the Dissent is in the Metals, but where the Menstrua are several, not so certain.

THe Second Letter of the Cross Row, is the Separation of Metals, and Minerals. Separation is of three sorts; the first is, The separating of the pure Metal from the Ure or Dross, which we call Refining. The second is, The drawing one Metal or Mineral out of another, which we may call Extracting. The third, The separating of any Metal into his Original or Elements, (or call them what you will) which work we call Precipitation.

For Refining, we are to enquire of it according to the several Metals: As Gold, Silver, &c. Incidentally, we are to enquire of the first Stone, or Ure, or Spar, or Marcasite of Metals severally; and what kind of Bodies they are; and of the degrees of Richness.

Also, we are to enquire of the Means of separating, whether by Fire, parting Waters, or otherwise.

Also, for the manner of Refining, you are to see how you can multiply the Heat, or hasten the Opening; and to save charge in the Refining.

The means of this is in three manners, that is to say, In the Blast of the Fire: In the manner of the Furnace to multiply Heat, by Union and Reflection: And by some Additament or Medicines, which will help the Bodies to open them the sooner.

Note, the quickning of the Blast, and the multiplying of the Heat in the Furnace, may be the same for all Metals; but the Additaments must be several according to the natures of the Metals.

Note again, That if you think the multiplying of the Additament in the same proportion that you multiply the Ure, the work will follow, you may be deceived: For quantity in the Passive will add more resistance, then the same quantity in the Active will add force.

For Extracting, you are to enquire what Metals contain others, and likewise what not? As Lead Silver, Copper Silver, &c.

Note, although the charge of Extraction should exceed the worth, yet that is not the matter; For, at least, it will discover Nature and possibility, the other may be thought on afterwards.

We are likewise to enquire, what the differences are of those Metals, which contain more or less, other Metals, and how that agrees with the poorness or richness of the Metals, or Ure, in themselves: As the Lead, that contains most Silver, is accounted to be more brittle; and yet otherwise poorer in it self.

For Principiation, I cannot affirm, whether there be any such thing, or no. And, I think the Chymists make too much ado about it. But howsoever it be, whether Solution or Extraction, or a kind of Conversion by the Fire, it is diligently to be enquired, What Salts, Sulphur, Vitriol, Mercury, or the like Simple Bodies are to be found in the several Metals; and in what quantity.

The

THe third Letter of the Cross-Row, is the variation of Metals into several Shapes, Bodies, or Natures; the particulars whereof follow,

Tincture.
Turning to Rust.
Calcination.
Sublimation.
Precipitation.
Amalgamatizing, or turning into a soft Body.
Vitrification.
Opening or dissolving into Liquor.
Sprouting, or Branching, or Aborecence.
Induration and Mollification.
Making tough or brittle.
Volatility and Fixation.
Transmutation or Version.

For Tincture, it is to be enquired how Metals may be tinted, through and through; and with what, and into what colours: As Tincting-Silver yellow. Tincting-Copper white, and Tincting red, green, blew, especially with keeping the lustre.

Item, Tincture of Glass.

Item, Tincture of Marble, Flint, or other Stone,

For turning to Rust, two things are chiefly to be enquired: By What Corrosives it is done, and into what colours it turns: As Lead into white, which they call *serus*; Iron into yellow, which they call *Crocus Martis*: Quicksilver into Vermilion, Brass into green, which they call *Verdegrafs*, &c.

For Calcination, to enquire how every Metal is calcined? And into what kind of Body? And what is the exquisitest way of Calcination?

For Sublimation, to enquire the manner of Subliming; and what Metals endure Subliming; and what Body the Sublimate makes?

For Precipitation likewise, By what Strong waters every Metal will precipitate? or with what Additaments? and in what time? and into what Body?

So for Amalgama, what Metals will endure it? What are the means to do it? And what is the manner of the Body?

For Vitrification likewise, what Metals will endure it? what are the means to do it? into what colour it turns? and further, where the whole Metal

Metal is turned into Glass? and when the Metal doth but hang in the Glassie part? also what weight the vitrified Body bears, compared with the crude Body? Also because Vitrification is accounted, a kind of death of Metals, what Vitrification will admit, of turning back again, and what not?

For Dissolution into Liquor, we are to enquire, what is the proper *Menstruum* to dissolve any Metal? And in the Negative, what will touch upon the one, and not upon the other? And what several *Menstrua* will dissolve any Metal? And which most exactly? *Item*, the process or motion of the Dissolution? The Manner of Rising, Boiling, Vaporizing? More violent, or more gentle? Causing much heat, or less? *Item*, the quantity or charge the Strong-Water will bear, and then give over *Item*, the colour into which the Liquor will turn? Above all, it is to be inquired whether there be any *Menstruum* to dissolve any Metal that is not fretting and corroding; but openeth the Body by sympathy, and not by mordacity or violent penetration?

For sprouting or Branching, though it be a thing but transitory, and a kind of toy or pleasure; yet there is a more serious use of it: For that it discovers the delicate motions of spirits, when they put forth and cannot get forth, like unto that which is in vegetables.

For Induration or Mollification, it is to be enquired, what will make Metals harder and harder, and what will make them softer and softer? And this enquiry tendeth to two ends.

First, for use; As to make Iron soft by the Fire, makes it malleable.

Secondly, Because Induration is a degree towards Fixation; and Mollification towards Volatility: And therefore the inquiry of them, will give light towards the other.

For Tough and Brittle, they are much of the same kind with the two former, but yet worthy of an Inquiry apart: Especially to joyn Hardness to Toughness; as making Glass malleable, &c. And making Blades, strong to resist, and pierce, and yet not easie to break.

For Volatility and Fixation, it is a principal Branch to be enquired. The utmost degree of Fixation is, That whereupon no Fire will work, nor Strong-water joyned with Fire, if there be any such Fixation possible: The next is, when Fire simply will not work without Strong-waters: The next is, when it will endure Fire not blown, or such a strength of Fire: The next is, when it will not endure Fire, but yet is malleable: The next is, when it is not malleable, but yet it is not fluent, but stupified. So of Volatility, the utmost degree is, when it will flee away without returning: The next is, when it will flee up, but with easie return: The next, when it will flee upwards, over the Helm, by a kind of Exufflation, without Vaporizing; The

The next is, when it will melt, though not rise ; And the next, when it will soften, though not melt. Of all these, diligent enquiry is to be made, in several *Metals* ; especially of the more extream degrees.

For Transmutation or Version , if it be real and true, it is the furthest point of Art ; and would be well distinguished from Extraction, from Restitution, and from Adulteration. I hear much of turning Iron into Copper ; I hear also of the growth of Lead in weight, which cannot be without a Conversion of some *Body* into Lead : But whatsoever is of this kind, and well approved, is diligently to be inquired, and set down.

THe fourth Letter of the Cross Row, is Restitution. First therefore, it is to be enquired in the Negative, what *Bodies* will never return, either by reason of their extream fixing, as in some Vitrifications, or by extream Volatility.

It is also to be enquired of the Two Means of Reduction ; and first by the Fire, which is but by Congregation of Homogeneal parts.

The second is, by drawing them down, by some *Body*, that hath consent with them : As Iron draweth down Copper in Water ; Gold draweth Quick-silver in vapor ; whatsoever is of this kind, is very diligently to be enquired.

Also it is to be enquired, what Time or Age will reduce without the help of Fire or *Body* ?

Also it is to be enquired, what gives Impediment to Union or Restitution, which is sometimes called Mortification, as when Quick-silver is mortified with Turpentine, Spittle, or Butter.

Lastly, it is to be enquired how the Metal restored, differeth in any thing from the Metal raw or crude ? As whether it becometh not more churlish, altered in colour, or the like ?

C

THE

THE
BOOK-SELLER
UNTO THE
READER.



Received some Moneths since these Articles of Enquiry, touching Metals and Minerals, from the hands of the Reverend Dr. Rawley, who hath published severall of the Lord Verulams Works since his Death. (He having been his Lordships Chaplain) and who hath been careful to Correct at the Press this little Piece (an Addition to the Natural History) according to the Original Copy, remaining amongst his Lordships Manuscripts: Amongst which there is nothing more of that subject to be found, so as no more Additions can be expected.

W. Lee.

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